VOL. XI. NO. 10. OCTOBER 1926.

MECCANO MAGAZINE

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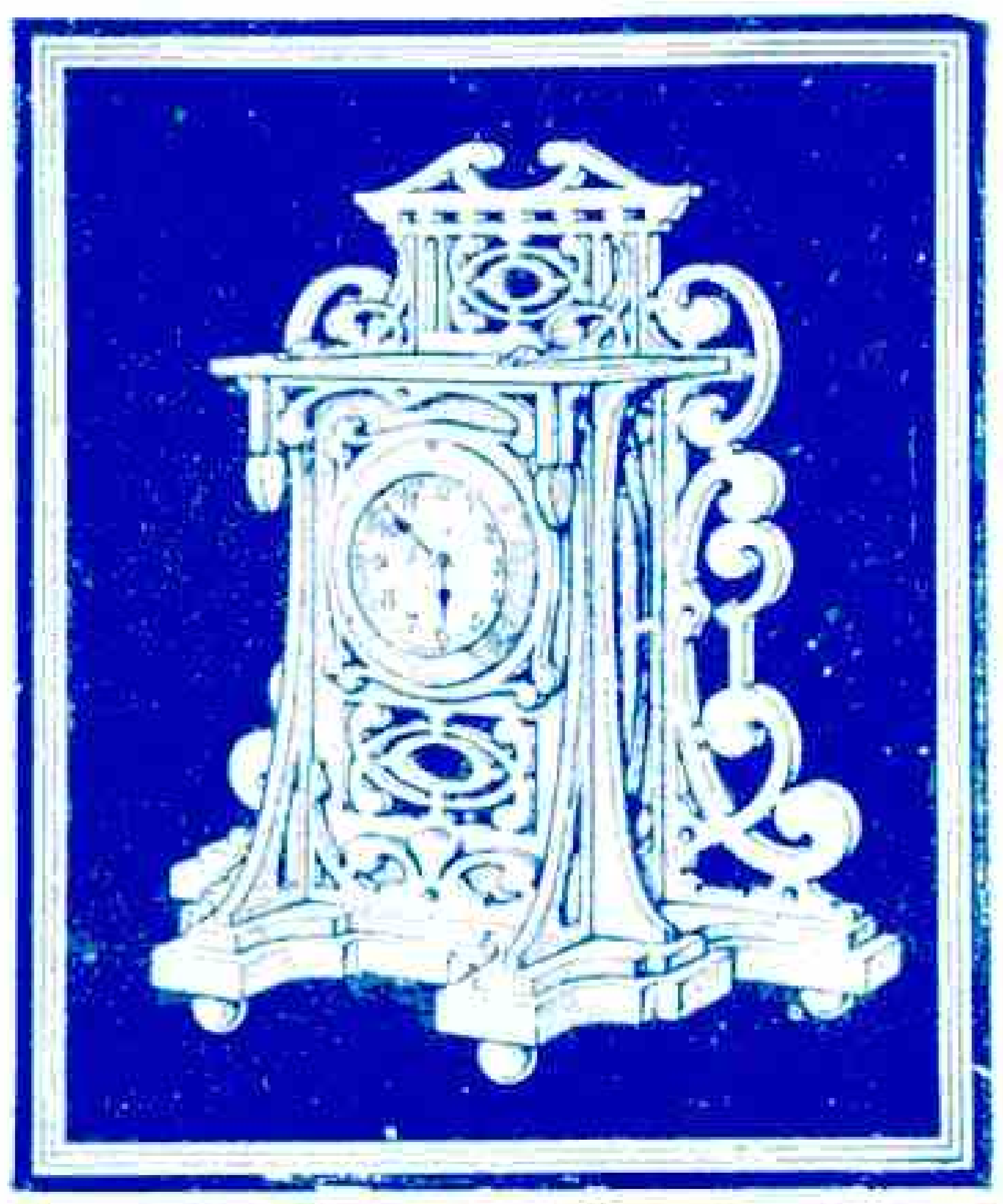
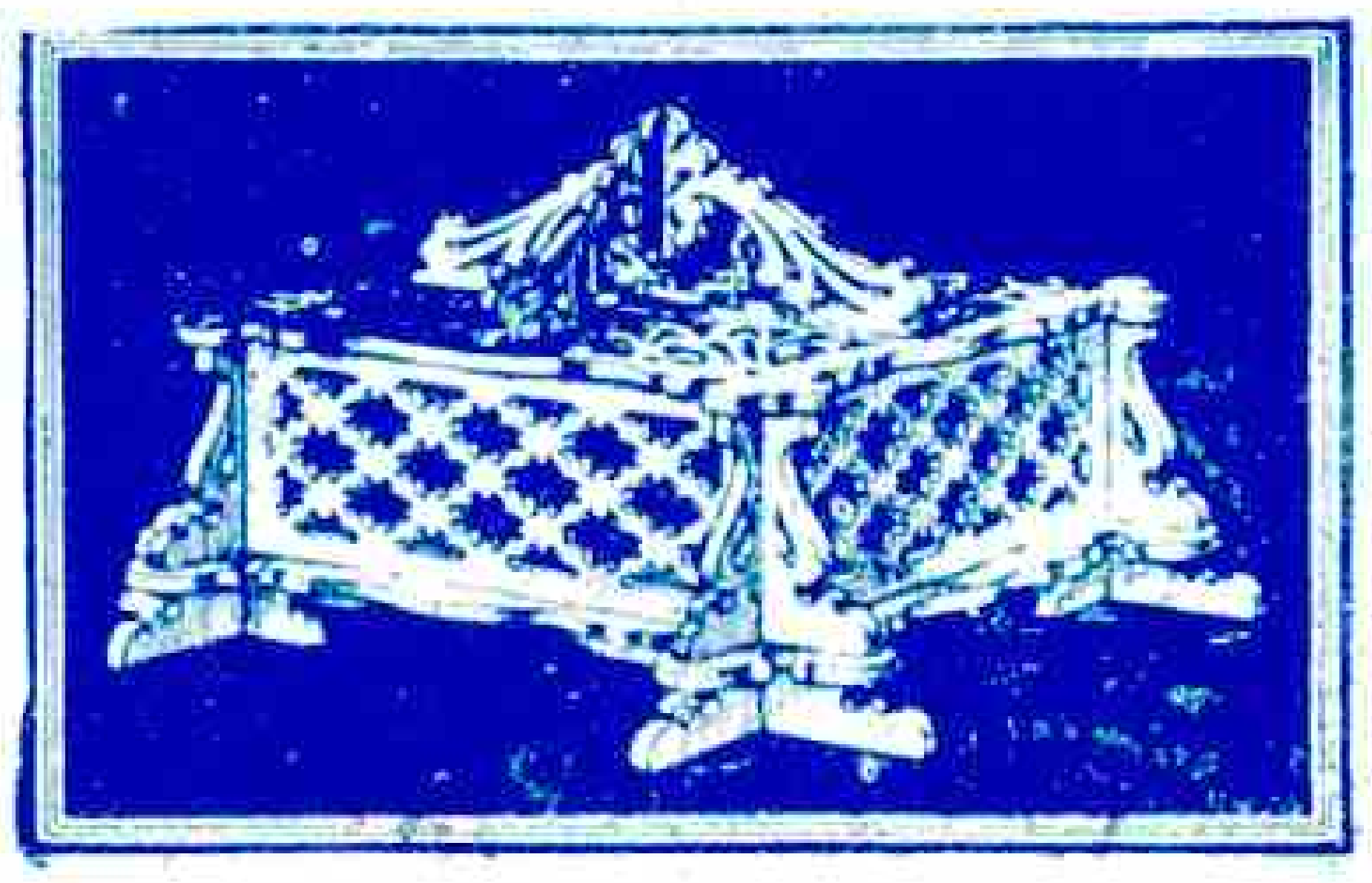
FRETWORK





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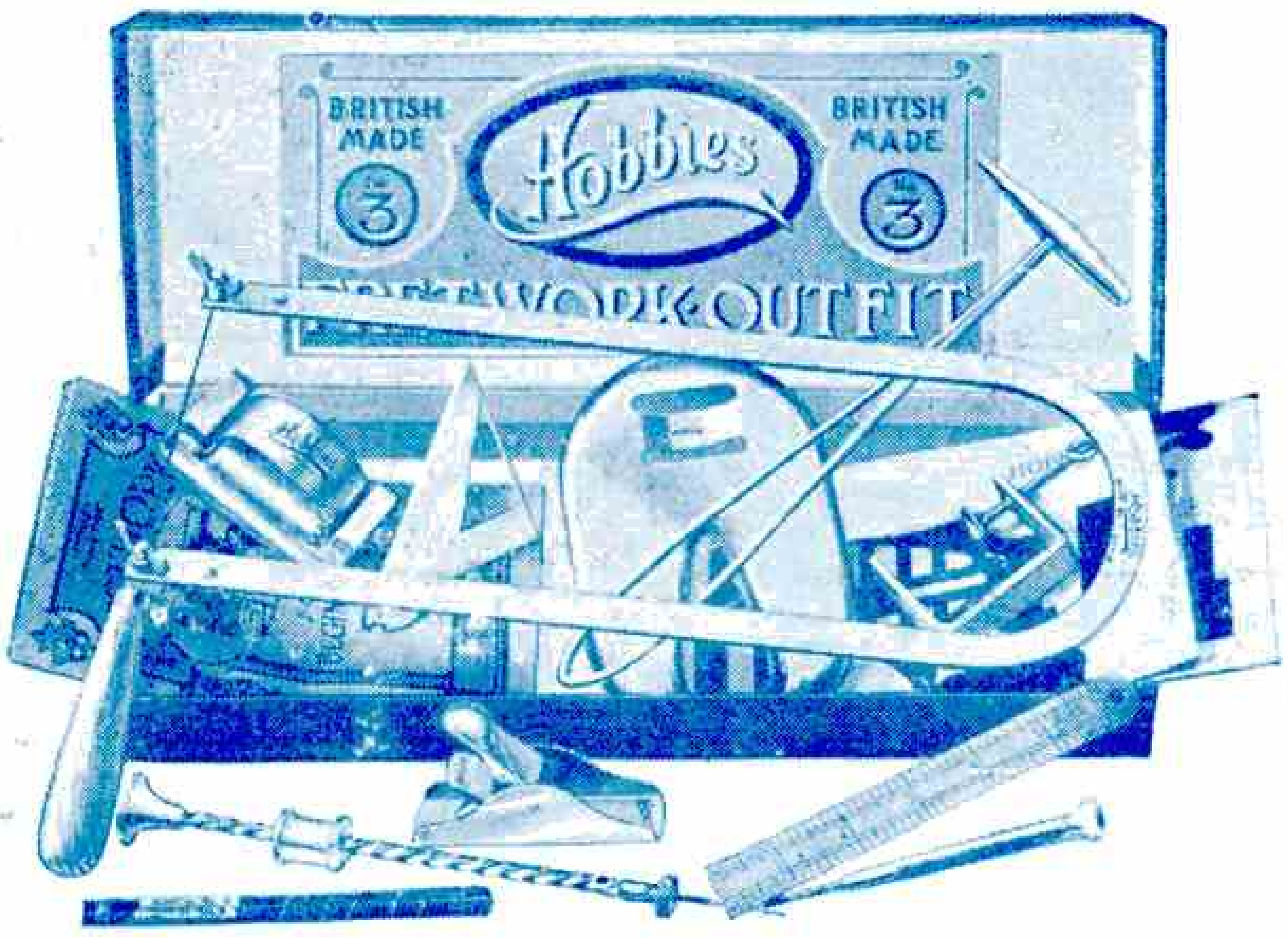

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MECCANO MAGAZINE

Editorial Office
Binns Road
Liverpool

Vol. XI. No. 10
October, 1926

With the Editor

The Geometry of the Telephone

The Jubilee of the telephone, which occurs this year, is responsible for a good deal of additional interest in the subject by the general public. By "general public" I mean—more particularly—fathers and uncles, whose interest in the telephone is at other times more often confined to saying uncomplimentary things about the system in general and their own individual instruments in particular! Of course, "*M.M.*" readers know all about Graham Bell and his invention—the story was told in our issue last December—but I think they may be interested in the following figures, which illustrate in a striking manner the complexity of a wonderful service that has grown up around us, one might almost say unnoticed, and one that is now accepted as a regular part of our everyday life.

If you make five dots on a sheet of paper and then draw lines connecting each dot with every other dot you will find there are ten lines. That is quite simple and straightforward, but if you make one more dot on the paper, and connect it with the other dots, fifteen lines will be required and the addition and connection of yet another dot means six more lines. So you can go on, and with every dot the number of lines increases in an alarming degree. If you could go on until you had 9,999 dots, and if you then added another, that 10,000th dot would mean adding another 9,999 lines. The number of possible connections between these 10,000 dots would then reach the stupendous total of 49,995,000—remarkable figures that clearly show the complications that arise as a telephone system grows. I am sure telephone engineers have our sympathy, although it is not unusual, of course, for a large town to have a 10,000 line exchange, with its enormous possibility of intercommunication. We must remember, however, that it is possible not only to connect every telephone in a town with every other telephone in that town, but also with every other town in the country, and even in other countries!

Bearing all this in mind, it certainly seems remarkable that we ever should be connected to the right number and I suggest you tell your dad about it next time you hear him courteously intimating to the operator at the exchange that she has put him on to the wrong number!

A Demand for Speed in the Navy

A peculiarity of the Washington Agreement between the five great naval powers was mentioned a short time ago on this page under the heading of "A Curious Result of Trying to do Good." I pointed out that the limitation of armaments imposed at the Washington Conference so reduced the armour-plating of our cruisers as to make them veritable death-traps for their crews.

There is yet another curious flaw—of engineering interest—in the Washington Agreement, also in connection with the restriction not to build cruisers exceeding 10,000 tons displacement nor to equip them with any larger armament than 8 in. guns. Nothing was said at the Conference about the speed, which is, of course, a most important factor to a cruiser. France has taken advantage of this loop-hole by recently laying down a cruiser designed for 10,000 tons displacement and 8 in. guns, to be engined at no less than 135,000 shaft h.p.! It is anticipated that this tremendous h.p. will give a speed of 37 knots, and it would seem that it will naturally follow that the new British cruisers of corresponding size will be engined at 140,000 shaft h.p. or even greater, and designed to attain a speed of 38 knots.

Thus, although it was believed that the Washington Agreement successfully curbed competition in cruiser construction, it would seem that it has left certain loop-holes that will result, in the first place, in competitive development of cruisers along lines that were never intended, and secondly, in leaving plenty of scope for the ingenuity of engineers to exploit these loop-holes to their fullest extent—if the authorities desire them to do so.

Probing the Mysteries of the Sphinx

I have referred from time to time on this page to the wonderful work of the engineers of old, and this month I am able to publish an article dealing more fully with this subject. The article is particularly interesting at the present time in view of the fact that recently there has been completed the task of uncovering that most mysterious of all Egypt's ancient monuments—the Sphinx, probably the greatest piece of sculpture in the world. Standing near it are the largest of stone-built erections, the great Pyramids, as well as colossal monuments, the method of erection of which has always been a puzzle to the modern engineer. Now an eminent archæologist, Dr. C. S. Fisher, declares he has solved the mystery of how the ancient Egyptians managed to handle and move such huge pieces of stone, and this is described in detail in our article this month.

An Amazing Work of Ancient Engineers

Whilst on the subject of the wonderful work of ancient engineers it may be interesting to refer to a recent discovery that has been made in Yucatan, by an expedition now exploring the lost cities of the ancient Mayas.

What has been found is a huge road or causeway, linking up two of the most important of the old Maya cities. This causeway is 50 miles in length, contains over a million tons of dressed stone, the quarrying, transport and facing of which represent an almost incredible expenditure of time and labour by ancient engineers. The stone blocks are 32 ft. in width and the whole causeway is raised from 2 ft. to 8ft. above the level of the forest. Although cement-covered roads are not unknown around many of the ruined cities of Yucatan, no such elevated causeway as this has been found elsewhere, nor does its like exist in any other part of the world.

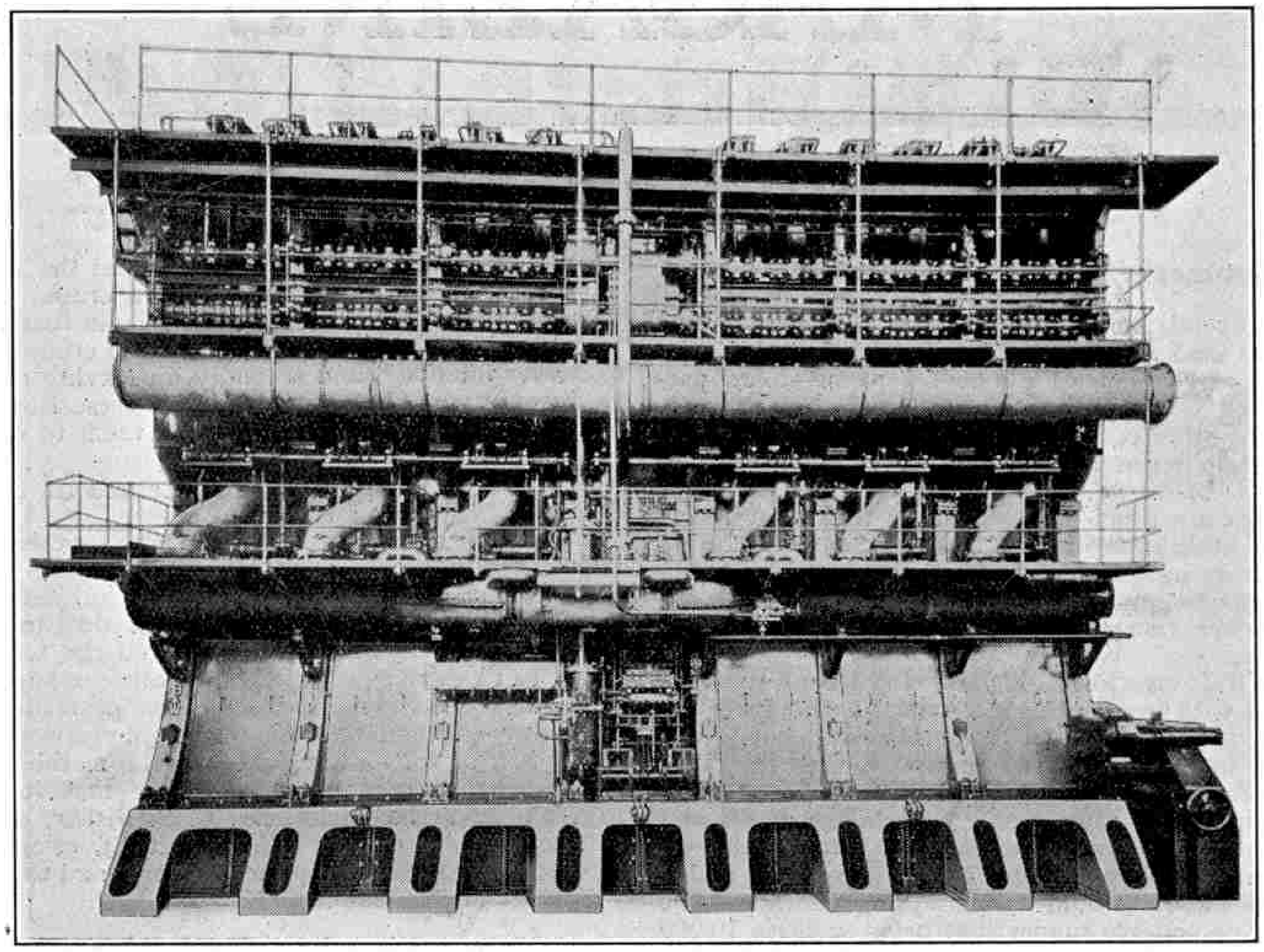
The purpose for which this great roadway was constructed is all the more remarkable when we remember that the Mayas had neither wheeled vehicles nor beasts of burden, and that therefore such a road—which would have served modern motorists as an admirable speedway—was apparently quite unnecessary. Dr. Gann, the explorer who found the road, suggests, however, that it was used as a ceremonial road. It was thus a kind of magnificent version of the "way" that exists in England and which was used by the Pilgrims of old in going from Winchester to Canterbury. Dr. Gann points out that this sacred way of Yucatan led to the centre of Chichen Itza, the capital of Yucatan. This city stood for nearly 1,000 years and was the centre of religious pilgrimages, as Mecca has been in the East for centuries.

Among the many other matters of engineering interest that the Yucatan explorers have found may be mentioned huge pyramids of stone, and a vast building standing on a stone terrace approached by a flight of steps 120 ft. in width and four feet in depth! This enormous building, standing nearly 150 ft. above the level of a lagoon that it faces, has been named "*Noh ka,*" which in the ancient Maya language means "The Great Temple."

Oil v. Steam on the High Seas

The Twin-screw Motor Liner "*Gripsholm*"

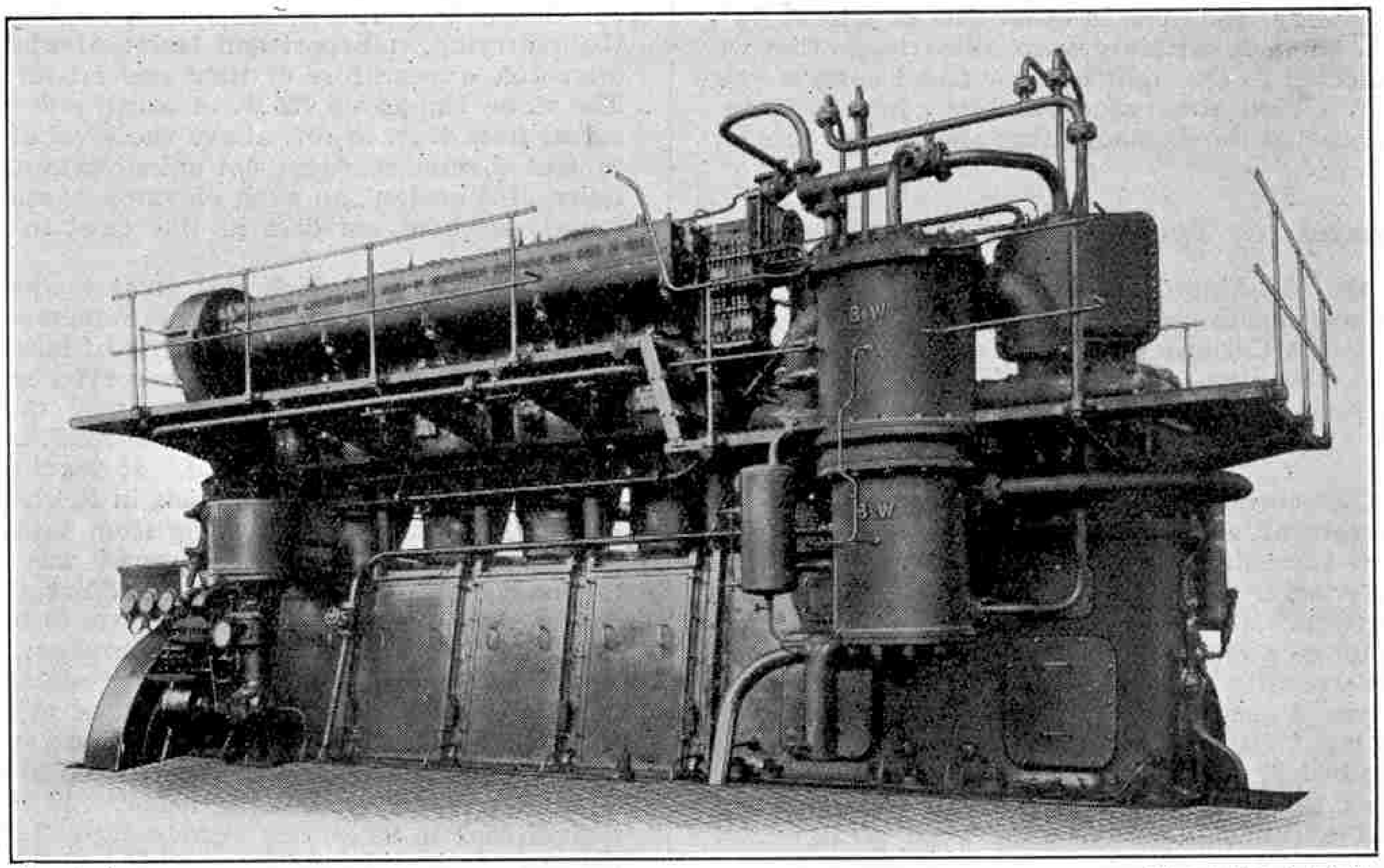
DURING the period in which the steam engine was struggling into efficiency, inventors never lost sight of the possibility of producing an engine that should be self-contained — in other words an engine needing no boiler.



Courtesy [Burmeister & Wain

One of the Main Engines

Towards the end of the 17th century various inventors expended a great deal of time and labour and ingenuity in the attempt to design an engine that would develop power by the explosion of gunpowder inside a cylinder. All these attempts failed to produce a practicable mechanism and gunpowder was abandoned in favour of certain gases and inflammable liquids. Probably the first man to achieve any success along these lines was a Frenchman named Lenoir, who about the year 1860 produced an engine that developed power by the explosion of a mixture of gas and air in a cylinder, thereby driving forward a piston which, through suitable mechanism, revolved a shaft. This engine was more interesting than efficient and it was left to Dr. N. A. Otto to produce, in 1876, a really efficient gas engine, from which the gas engines of to-day have been developed.



Courtesy] [Burmeister & Wain

One of the three Diesel-driven Compressors

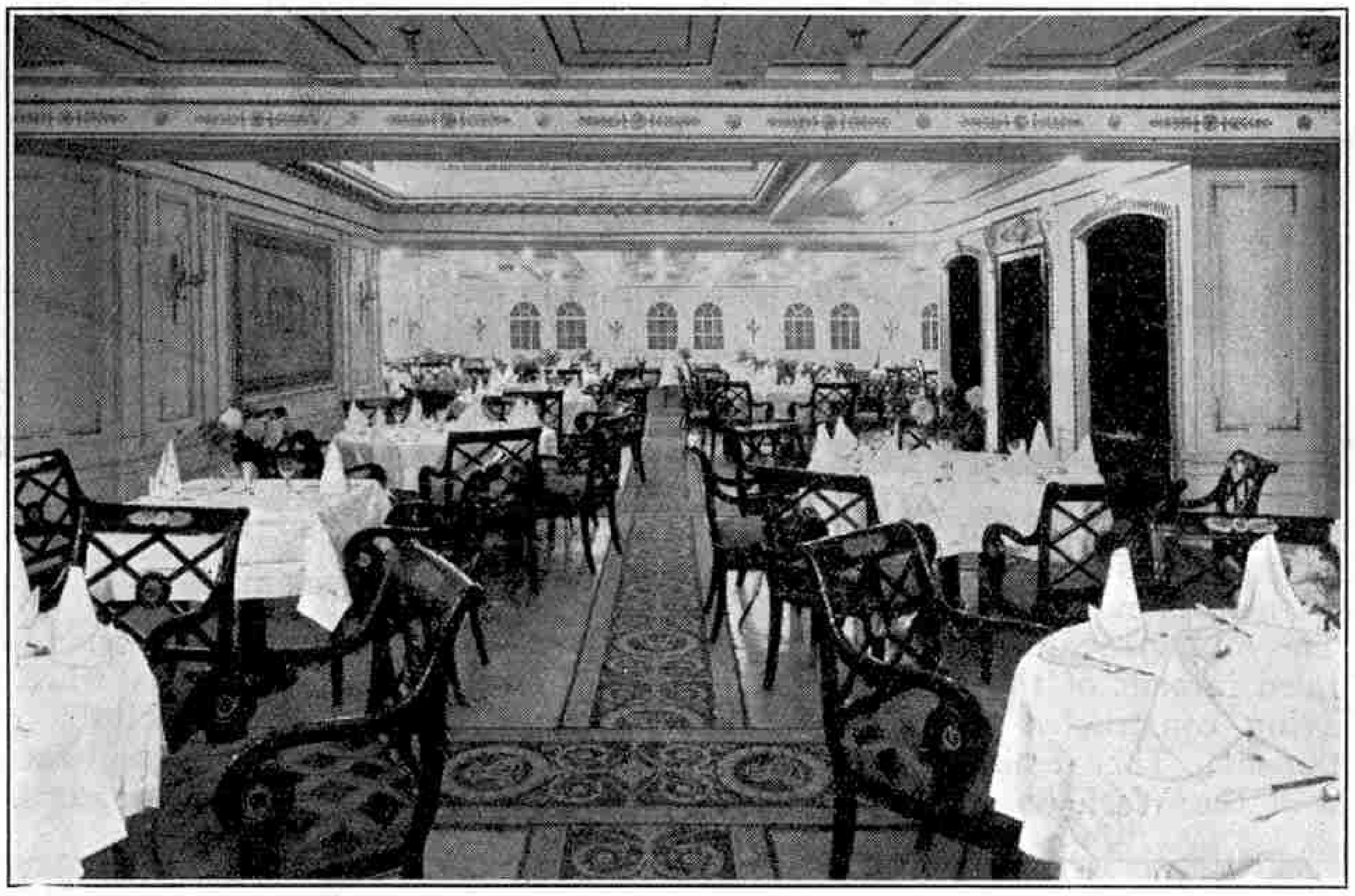
Early Experiments with Liquid Fuel

We have mentioned that these early inventors experimented with liquid fuel as well as gas. The difficulties to be surmounted in the utilisation of such fuel were even greater than in the case of gas, but gradually the various obstacles were overcome and in 1884 Gottlieb Daimler brought out a practical petrol engine, from which are descended the engines that to-day are providing motive power on land, on sea and in the air.

These engines utilise the spirituous products of petroleum, which are vaporised at ordinary temperatures in a carburetter. There is also another type of engine operating on the same principle but utilising kerosene or lamp oil or crude petroleum. These fuels are heavier than petrol and require a higher temperature to convert them into vapour. When vaporised they are just as effective as petrol for power production and in addition they have the advantage of being cheaper. Engines of this latter type are known as oil engines, as distinct from petrol motors using the lighter fuel.

The Diesel Engine

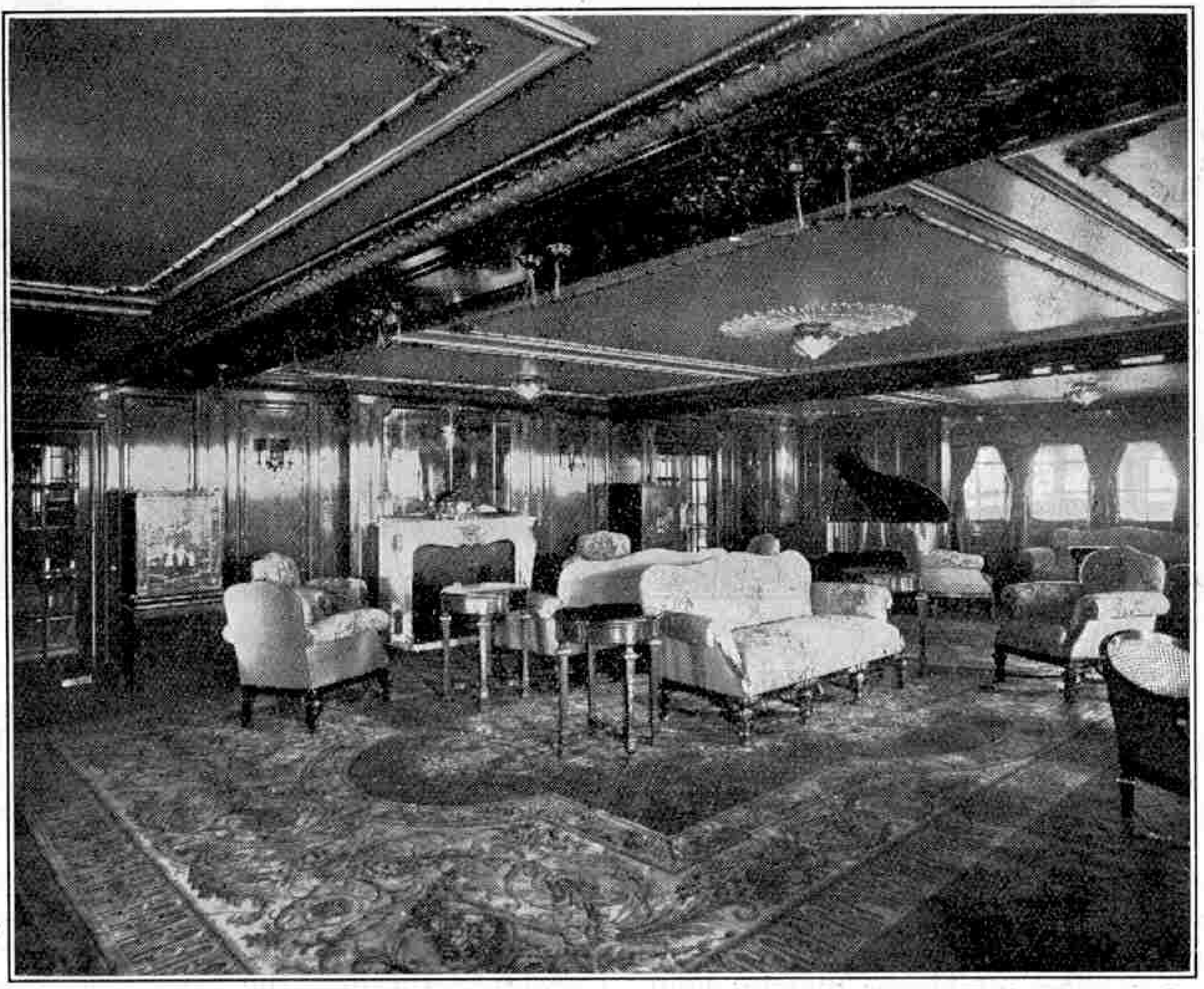
One of the most efficient of present-day oil engines is that known as the "Diesel" engine, for which a patent was taken out in 1895 by Dr. Rudolph Diesel. This engine had many advantages which rapidly brought it into favour for certain types of work. It had the merit of simplicity on account of the absence of boilers, vaporisers, carburetters or sparking mechanism, while the fuel it utilised was comparatively difficult to ignite and therefore much less liable to lead to fires or explosions than the very inflammable petrol.



Photo] [Bedford, Lemere & Co.

First-Class Dining Saloon

The Diesel engine differs from other self-contained engines—or internal combustion engines as they are called—in that the charge taken in during the suction stroke consists of pure air only, which is compressed to somewhere about 500 lb. per square inch. The air is thus raised to a temperature sufficiently high to ignite the oil fuel. The latter is sprayed into the cylinder at the end of the compression stroke by a blast of compressed air from a separate reservoir, maintained at a pressure of from 100 lb. to 150 lb. per sq. in. in excess of the maximum pressure in the cylinder. It is important to notice that in the Diesel engine the fuel is not exploded, as in the petrol motor, but is burned.



Photo] [Bedford, Lemere & Co.

The Luxuriously-Appointed Lounge

When the Diesel engine was introduced it was realised immediately that, if it could be adapted to ship propulsion, it would bring about a great saving in many directions. The number of men required for running the engines would be greatly reduced, as stokers and coal trimmers would not be required, and there would also be a very large reduction in the amount of space required for carrying fuel. The original Diesel engine had certain defects, however, which delayed its application to marine propulsion, but most of these difficulties have now been overcome and to-day the marine Diesel engine is being installed in vessels of all types and is so successful in its performance that it is rapidly becoming a formidable competitor to the steam engine.

Among the passenger liners that have been equipped with Diesel engines the "*Gripsholm*" is conspicuous by reason of the completeness of her equipment and the luxurious nature of her fittings and decorations. In addition, she is the first twin-screw ship of her class.

Our cover this month is a specially coloured photograph illustrating the "*Gripsholm*" ready for her first voyage.

The "*Gripsholm*" was constructed by Sir W. G. Armstrong, Whitworth & Co. Ltd., for the Gothenburg-New York service of the Swedish American Lines. Her overall length is 574 ft. 6 in. and her beam 74 ft. Her gross tonnage amounts to 17,300 tons, which includes an oil fuel capacity of 2,450 tons.

The vessel is named after the historic Gripsholm Castle, for long the home of the Kings of

(*Continued on page* 620)

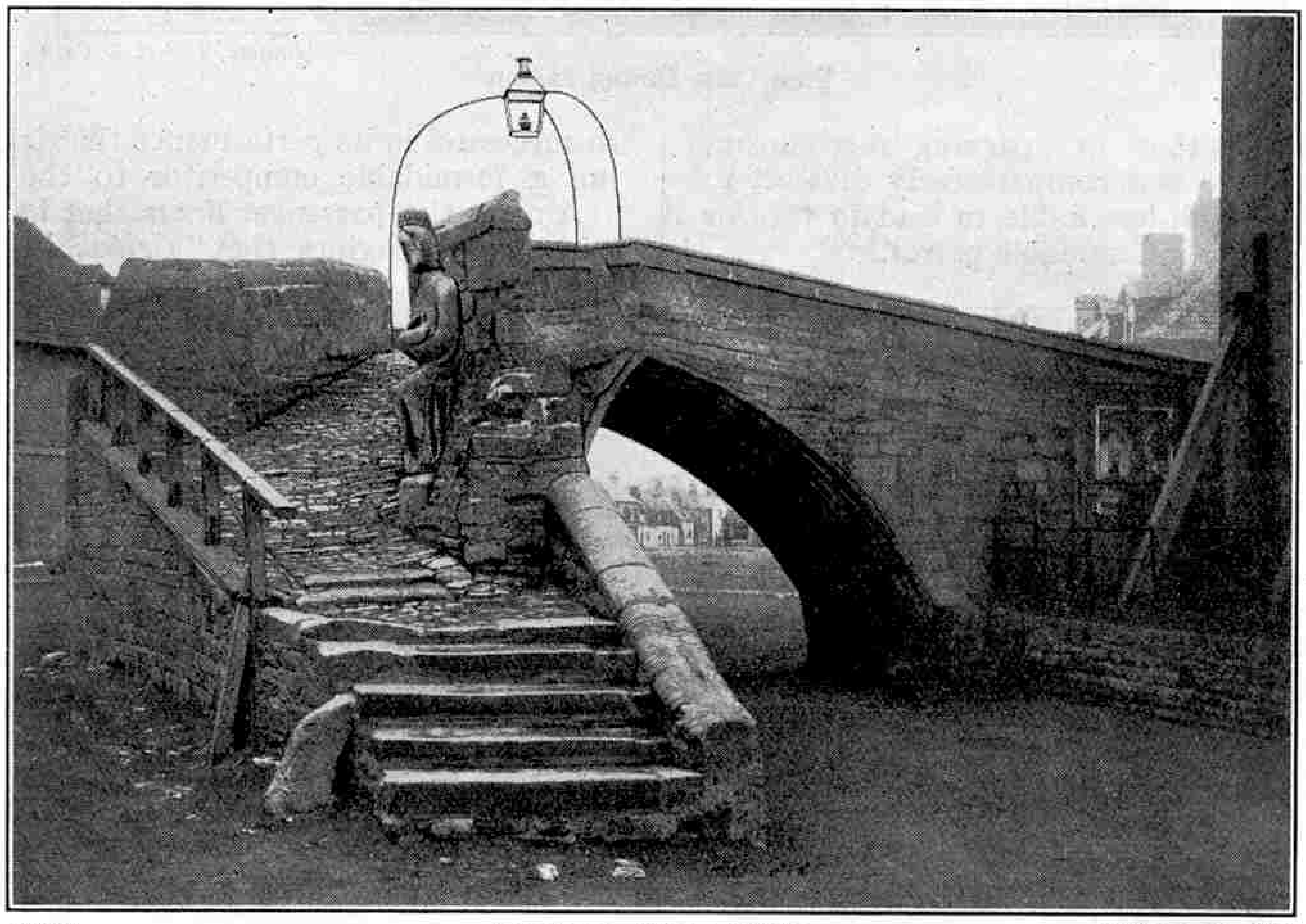
Coat of Arms of Vermuyden Family

Lives of Famous Engineers

XXXIII.

SIR CORNELIUS VERMUYDEN AND DRAINAGE OF THE FENS

CENTURY after century the sea has been encroaching upon the low-lying portions of the English coast at points where there is no barrier of rock to resist its onslaught. The Romans realised the necessity of checking the continued inroads of the sea and they are credited with having constructed the first protective earth embankment. This embankment was built along the shores of the Wash on the east coast with the object of protecting the low-lying area, known as the Fens, from invasion by the waters of the North Sea. In addition a channel nearly 40 miles in length was dug along the foot of the higher lands bordering the Fens, to prevent the low land from being flooded during the rainy season by the fresh water draining from the uplands.



Photo] **Crowland Abbey Bridge** [*Frith & Co. Ltd.*

The protecting bank along the Wash lacked satisfactory provision for sluicing and although the sea was prevented from swamping the Fens, the numerous channels across the levels were similarly prevented from passing off with the ebb tide in the Wash. The benefit of the embankment was thus in large measure reduced and for many centuries the great level of the Fens remained a desolate and water-logged area.

During winter months the swollen channels and rivers converted the levels into a great inland sea, in which here and there patches of higher marshy land formed dismal islands. The flooded region then extended from Lincoln to Cambridge, a distance of roughly 70 miles, and averaged 30 miles in breadth. Extraordinary though the statement may appear, villages on the inner fringe of the Fens became fishing ports.

Monks Attempt Reclamation

In the tenth century the islands in this flooded area became the abode of monks who, after making the dismal wastes a little more habitable, erected monasteries and subsequently devoted considerable time and energy to reclaiming the adjacent swamps. In the eleventh century the islands of the Fens were the scene of desperate fighting by Hereward the Wake, who held out stubbornly against the Norman invaders for about a year until finally defeated by King William, who penetrated into the marshes by constructing a causeway. The story of this English patriot's career is told in a fascinating manner by Charles Kingsley in his book *"Hereward the Wake,"* which everyone should certainly read.

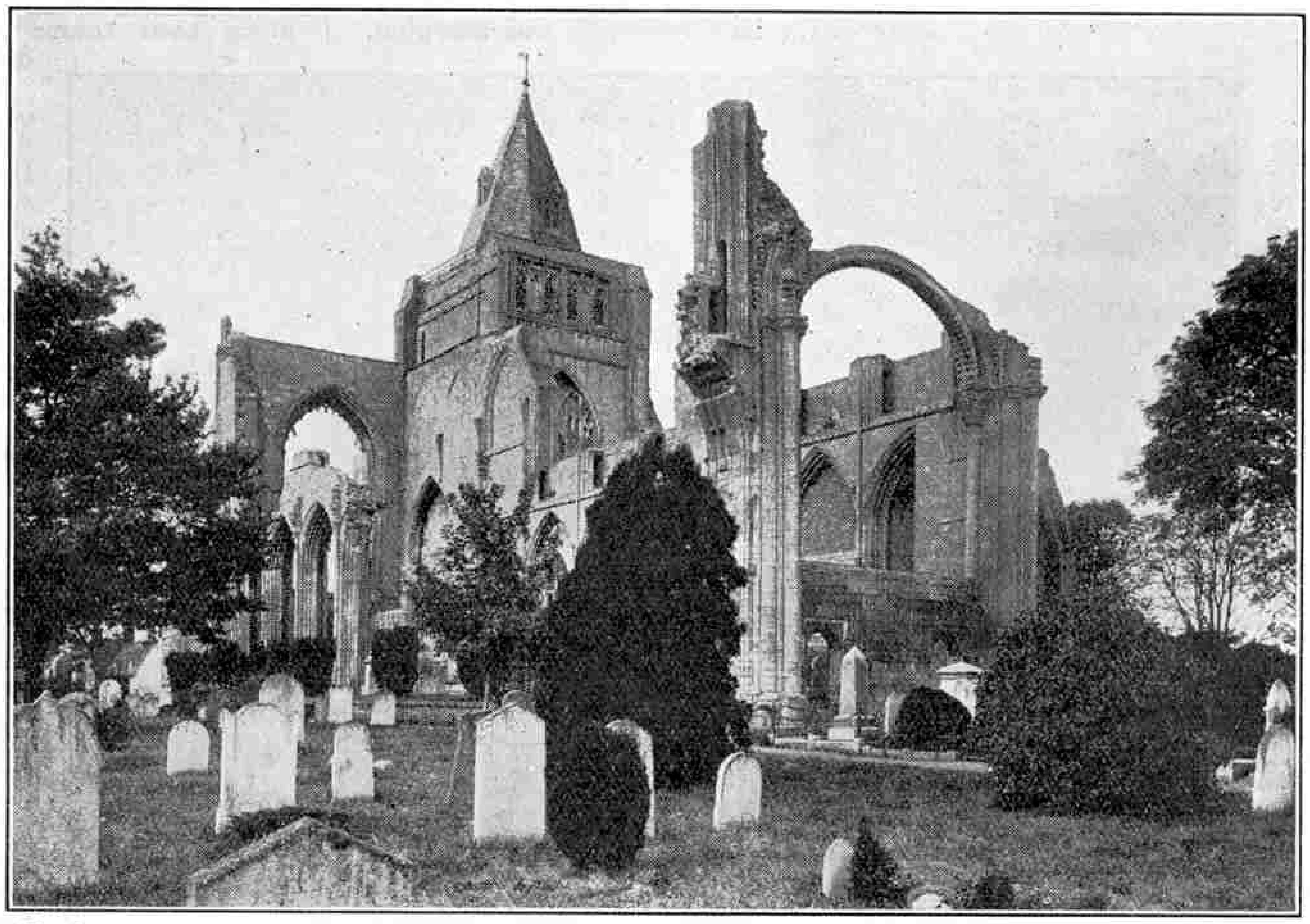
With the closing down of the monasteries by Henry VIII. in the early sixteenth century the work of reclaiming and protecting the Fen islands ceased, and gradually the great level reverted to its original state.

Where the rivers merged into the Wash they became choked up with silt washed down from the upper reaches. The surplus water, unable to flow seaward, spread over the low land, while the current forced new watercourses through the bogs and undermined embankments already weakened by neglect. With every big flood the islands of the Fens became further submerged. Some of the more serious of these inundations resulted in heavy loss of life and the inhabitants of the district appealed to Parliament for help, but for a long time little or nothing was done to improve matters.

King James Moved to Action

In 1607 floods caused such damage and widespread distress that James I. was moved to action and vowed that, for the honour of his kingdom, such distress must be prevented. He declared that, if no one else would volunteer, he himself would undertake the task of reclamation and protection.

A survey of the Fens showed that as much as 307,202 acres required draining and safeguarding. King James did not succeed in raising the money needed to carry out this large undertaking, but two years later he succeeded in arranging for the draining of a considerable area, 6,000 acres in fact, in the Waldersea portion of the Fens.



Photo] **Crowland Abbey** [*Frith & Co. Ltd.*

He entrusted this work to various individuals each of whom was to retain two-thirds of such land as he retrieved. This scheme was not very successful, however, because the people concerned knew little or nothing of land drainage, with the result that one section was freed from water only at the expense of the flooding of the adjoining area!

Cornelius Vermuyden Engaged

The reclaiming of the Fens was not the only problem of the kind at that time. Another difficult matter was that of preventing the river Thames from constantly breaking down its artificial embankment and flooding the surrounding country.

By degrees the King came to realise that the expert advice and engineering knowledge necessary to tackle these problems could not be obtained in England, and he therefore decided to engage a Dutch engineer named Cornelius Vermuyden, who came to this country in 1621.

Cornelius Vermuyden was born at St. Martin's Dyke, in the Island of Tholen, Zeeland, about 1595. During his youth he had numerous opportunities of studying the building of embankments and dykes and the art of draining land below sea level, for upon these things depended the immunity of his homeland from flooding by sea. It was natural that he should train as an engineer and in due time he became proficient in all the latest methods of protecting land from inundation.

The Stopping of Dagenham Breach

Vermuyden brought a considerable number of Dutch labourers with him to England, for they were well versed in the particular type of work he was to supervise. His first task was the stopping-up of a serious gap in the Thames embankment at Dagenham, made by a high spring tide. The breach had resulted in the flooding of a large expanse of low-lying country behind the river bank. He effectually repaired the gap and also built up proper embankments along the rivulet at Dagenham Creek to the point where it joined the Thames. Across the mouth of the rivulet a sluice was erected, consisting of a strong gate suspended by hinges. At high tides the sluice kept out the tidal waters of the Thames, but at low tide it could be raised to permit the passage into the Thames of surplus inland water.

This work proved so successful that Vermuyden was immediately appointed to superintend the drainage of the Royal Park at Windsor.

Drainage of Hatfield Level

When a number of minor works had been completed Vermuyden was interested by the King in the problem of draining his lands at Hatfield Level, an area of about 70,000 acres lying alongside the royal manor of Hatfield. Hatfield Level adjoins the Isle of Axholme, and the two are swamp districts similar to the great level of the Fens, but situated farther north, where the boundaries of Yorkshire, Lincolnshire and Nottinghamshire meet.

As in the case of the Fens, Hatfield Level was scarred by numerous irregular channels that meandered across the marsh to the coast, and was also the scene of many small lakes abounding in fish. Attempts to drain the level had hitherto proved unsuccessful and a local body of men summoned by James I. to discuss the matter declared such a project impossible.

Charles I. Signs Contract

Vermuyden, with the confidence of his race, and strengthened by his years of practical experience, announced that he himself would undertake what the committee had declared could not be accomplished. Considerable time elapsed before anything was settled, but on 24th May, 1626, a contract was signed between the Dutch engineer and James' successor, Charles I. Vermuyden undertook to win back the flooded area and render it fit for cultivation, in return for which he and his partners were to be granted one-third of all land so reclaimed.

Finding it impossible to raise sufficient funds in England, Vermuyden visited his own country where his reputation soon enabled him to form a company. Many of those who joined his scheme and came to England with him, in readiness to take over such land to which their subscription entitled them, had profited considerably from similar investments in their own country and were full of enthusiasm for the English scheme.

Photo] [*Valentine & Sons Ltd.*

Trusthorpe Mill, Mablethorpe, showing typical drainage channel

Diverting the Don Causes Trouble

The Dutch workpeople already in England were again employed. Streams were diverted from their erratic courses across the marsh by the cutting of direct channels to the river Trent, and other channels were cut to drain the large meres near Hatfield and Thorne. A further step was the diversion of the waters of the Don from their eastern course through the Hatfield Level into a northern tributary that ultimately joined the river Aire, and this nearly ruined Vermuyden's scheme. The northern channel proved an insufficient outlet for the whole of the Don waters and serious flooding of the Fishlake and Sykehouse areas took place. This was too much for the dwellers on the northern bank of the Don, who from the first had been bitterly opposed to the plan to divert the river, and they demolished the embankment and attacked the foreign workpeople, whom they regarded as plunderers.

Vermuyden Knighted

Vermuyden did his best to appease the angered inhabitants. He engaged English workmen at much higher wages than had yet been paid for drainage work, and the task of remedying the damage as effectually and cheaply as possible was pushed forward. A new deep, broad channel, known as the Dutch river, was excavated from Turnbridge, near Snaith, and the waters of the Don were re-diverted directly into the river Ouse, at a point near Goole. This extra work cost £20,000 and told heavily on the company's funds, but the operations were completed within the contract period of three years.

In recognition of the success of his efforts Vermuyden was knighted by King Charles on 6th January, 1629.

The land reclaimed proved rich and favourable to cultivation and within the year Vermuyden leased the whole of Hatfield Level, amounting to about 24,500 acres, for the sum of £16,080, and a yearly rental of £195 3s. 5½d., one red rose (the ancient annual rent), and an improved rent from Christmas 1630 of £425. Many of the Dutch workpeople settled on the land and farmsteads, windmills and chapels gradually came into being. The native inhabitants of the surrounding districts remained so hostile to the Dutch, however, that Vermuyden finally sold his interests in the land to others.

The Hatfield scheme had scarcely been finished when Vermuyden was sent for by the Commissioners of Sewers at Huntingdon to discuss the drainage of the great level of the Fens. Long neglect of the embankments and drainage channels had resulted in the waters steadily reconquering the marshy land. The Dutchman's offer to drain the level by his own plan and to find the money to carry out the work, in return for a grant of 95,000 acres of the land retrieved, was accepted. Public opinion objected to so much land being handed over to a foreigner, however, and the contract was revoked.

Draining the Great Bedford Level

It was now necessary to find an Englishman to finance the work if it was to be carried out, and Francis Russell, 4th Earl of Bedford, was persuaded to finance the drainage of the large area of the Fens known as the Great Bedford Level, in Cambridgeshire. Vermuyden's plans were accepted and he was appointed engineer to the scheme. Funds were very limited, and before the work was fully carried out the Dutchman had himself advanced so much money toward the project that several thousand acres of land had already been signed over to him by the promoters as payment of their debts.

Many of the inhabitants around the Cambridge and other Fens derived a living from fishing in the extensive meres or by snaring wild duck, and they viewed the draining of the level and the disappearance of the lakes with alarm and anger. Raids upon the Dutchman and his works were frequently organised, the Fen dwellers following up the workmen, demolishing the newly-built embankments and filling up the channels. So bitter became the feeling between the parties that Vermuyden had to protect his workpeople by armed guards! Nevertheless the work was pushed steadily forward and in 1637 was declared completed.

Dutch Methods Unsuitable

Unfortunately the extensive drainage did not prove successful in rendering the whole area suitable for agriculture. Many large patches remained wet and boggy, and in 1634 the Commissioners of Sewers declared the works to be faulty and the district liable to serious flooding. The trouble lay in the unsuitability of Dutch methods for English conditions. In Holland the chief tasks were the curbing of rivers and the holding back of the ocean. Where the rivers passed through the low-lying country they were built up along their course to the sea without difficulty.

The inundated areas of the Fens, however, demanded not only that the streams should be restricted to prepared channels and the tidal waters kept off by strong banks, but that ample outlet should be arranged for the "fresh" of the rivers and streams, and for the egress of the considerable inland rainfall upon the low levels during the winter seasons.

The pessimistic report of the Commissioners inspired King Charles to take a hand and further operations to his design were begun by Vermuyden. Progress was brought to a standstill, however, by the strife that arose between Charles and Parliament. Oliver Cromwell increased the discontent among the native people of the Fens by hinting that the King was employing Vermuyden and his men to free the land from water merely to sell it afterwards to his own profit. Cromwell's fiery speeches were eagerly listened to and he was acclaimed "Lord of the Fens."

Reclamation Works Destroyed

The serious unrest in the Cambridge district spread to the northern Fens, where some reclamation of swampy areas had been carried out by private enterprise. Mobs of men demolished the protecting embankments, set fire to farms, destroyed the cattle and in some instances killed the unfortunate farmers. Drainage channels were blocked up and the waters again allowed to flood the land. The areas thus laid waste included the Lindsay Level, which comprised 35,000 acres of land, successfully drained and embanked by the Earl of Lindsay.

Civil War in 1642 made matters worse. At York a Parliamentary Committee was formed to safeguard the county from invasion by the King's forces. Late one day a rumour reached York that the Royalists were preparing to cross the river Don and march on the Isle of Axholme. The "Watch Committee" immediately ordered the embankments to be pierced and the floodgates lifted at specified points. When morning dawned Hatfield Level and the neighbouring Fens were once more under water and the labour of many years was completely ruined.

Work Resumed on Great Bedford Level

An effort of the Duke of Bedford's Company in 1641 to obtain the authority of Parliament to

(*Continued on page* 620)

FROM OUR READERS

This page is reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of general interest. These should be written neatly on one side of the paper only, and they may be accompanied by photographs or sketches for use as illustrations. Articles that are published will be paid for at our usual rates. Statements contained in articles submitted for this page are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

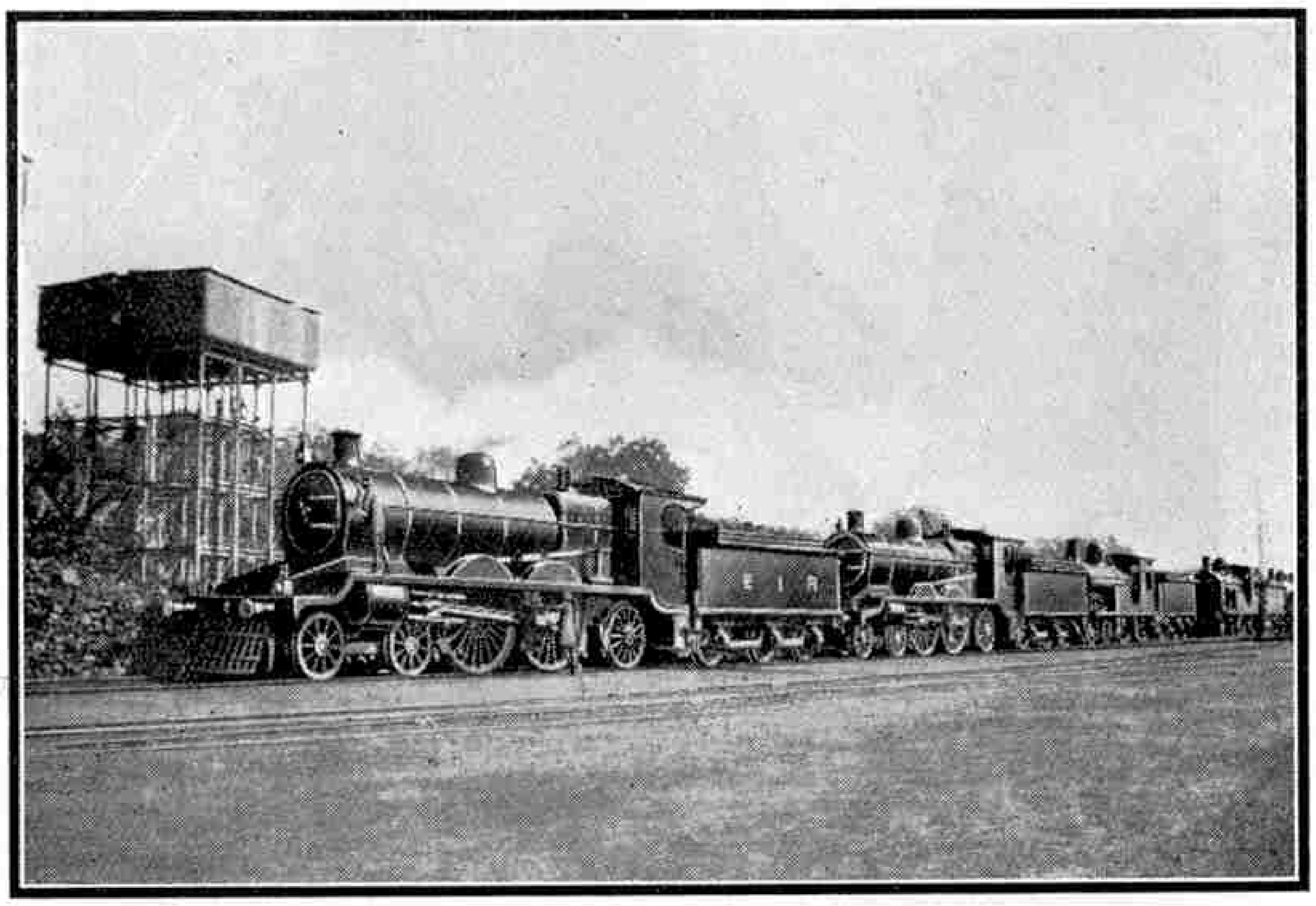
The East Indian Railway

The accompanying illustration shows a group of locos of the East Indian Railway, an important line owned and worked by the State. The headquarters of the railway are at Calcutta, Howrah Station, the terminus being an extremely fine and in fact almost palatial building.

This railway is notable for the number and size of its bridges. Foremost among these is the Sone Bridge at Dehri, on the Grand Chord line, which forms part of the mail route from Calcutta to Bombay. This bridge has 93 spans of 100 ft. each and a total length of 10,052 ft. This compares well with the Tay Bridge in Scotland, which has a total length of 10,711 ft.

When the King and Queen visited the great Durbar at Delhi in 1911 a Royal train was specially built by the East Indian Railway. This train was a marvellous example of the art of the carriage builder, and was constructed throughout on a scale of magnificence that has never been equalled by any train in England.

W. Henry (Delhi).



The River Shannon Power Scheme

All round the little village of Ardnacrusha the peaceful country has been transformed into a hive of industry and activity. The smiling pastures have been sacrificed to subdue the lordly River Shannon, which is to produce electricity for the whole of the Irish Free State. The work is already two months in advance of schedule. The whole place is a network of light railways and many trains are busily engaged in taking away the earth excavated by two huge electric dredgers. In regard to these dredgers it is interesting to note that when the chain of buckets encounters a rock each successive bucket rises over the rock and dips down again over the other side. In the evenings the rock is mined and blasted. Several steam cranes are used for loading the trains. Electric cables run in all directions conveying current to the various machines, most of which are the products of the German Krupp Works.

S. O'Mullane (Mitchelstown, Co. Cork).

An Old Driver's Reminiscences

For a long time I could not get the veteran driver to talk about himself, but he gradually " thawed " as he realised that I was not up to any tricks but was genuinely interested in his work and in his beloved loco. One day, choosing the moment when the old man had just got his pipe going and was looking the picture of contentment, I summoned up enough courage to ask him how he became an engine driver.

After eyeing me contemplatively for a moment or two he began.

" I started when I was 16 as a cleaner attached to an engine-shed, and dirty work it was. An engine may look spick and span at the beginning of the day, but at the end of a long run, perhaps through rain, snow or fog, its appearance is greatly altered and a laborious task is set for the gang of cleaners who have to get it presentable again for the next day's work.

" To begin with I was put on the large surfaces—the boiler covering, cab sides, tender sheets, wheels, etc. As my knowledge of engines increased I was given the working parts, motion rods and such like, with sometimes a chance to help the fitters on a repair job.

" After about two years at cleaning I qualified as a ' passed cleaner ' and became a fireman on a shunting engine—a dreary, monotonous sort of job. More often than not it was necessary to use poor coal, and then it was hard work to keep up steam and at the same time prevent the fire grate from becoming choked. It taught me a lot, however, and that was all that really mattered.

" For several years I stayed in the fireman's grade, gradually rising from shunting engine to local passenger and so on to main line working. Next I went in for the driver's examination and passed, but even then it was a good time before I got a chance of driving.

" My next step took me once more to a shunting engine, but this time in charge of the regulator. This lasted for several years until I was put on a goods train. Next came a turn on local passenger work, and now for the last 12 years I have been on main line driving."

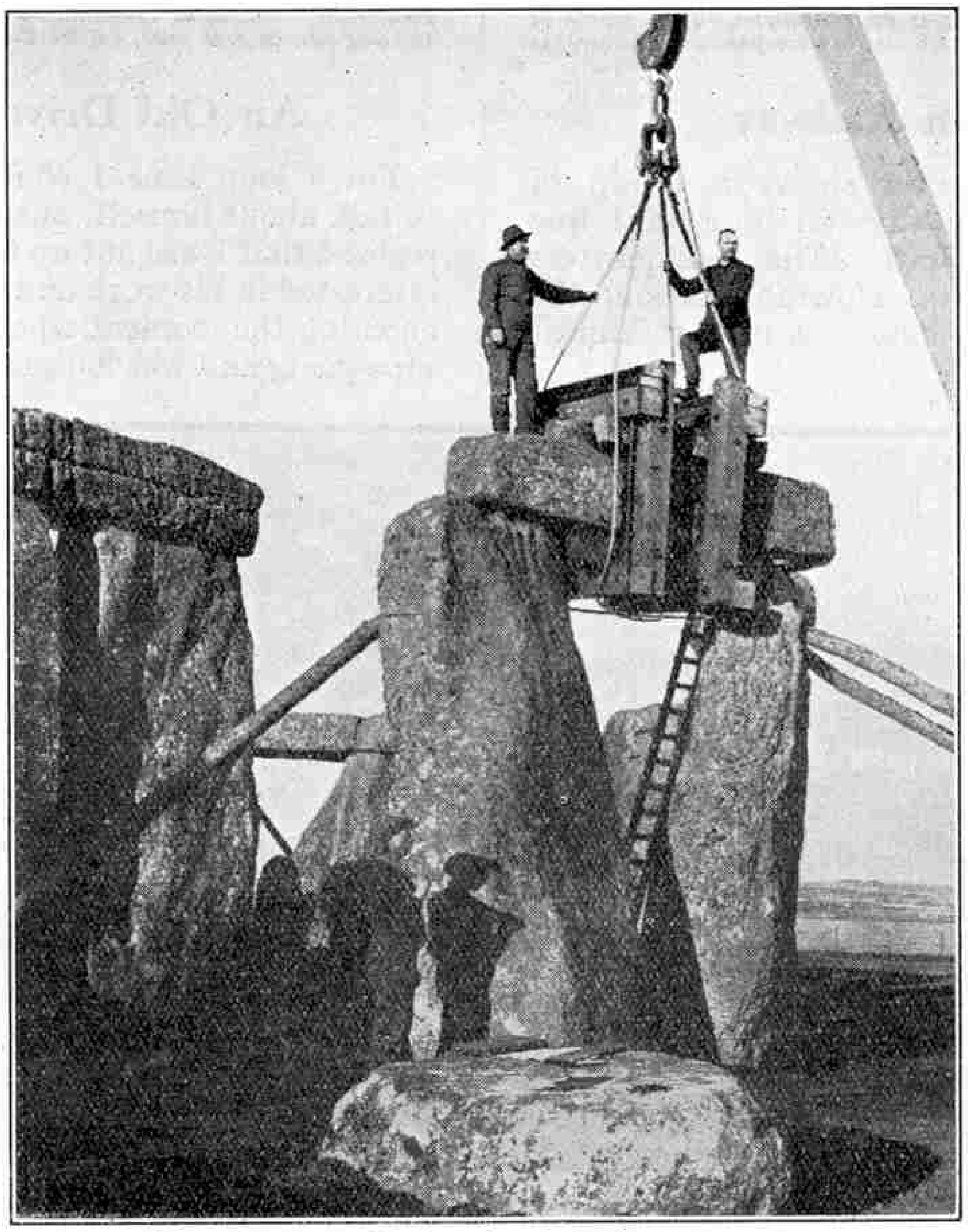
K. Bindoff (Ramsgate).

Marvels of Ancient Engineering

The Stupendous Buildings and Monuments of Thousands of Years Ago

By Harold J. Shepstone, F.R.G.S.

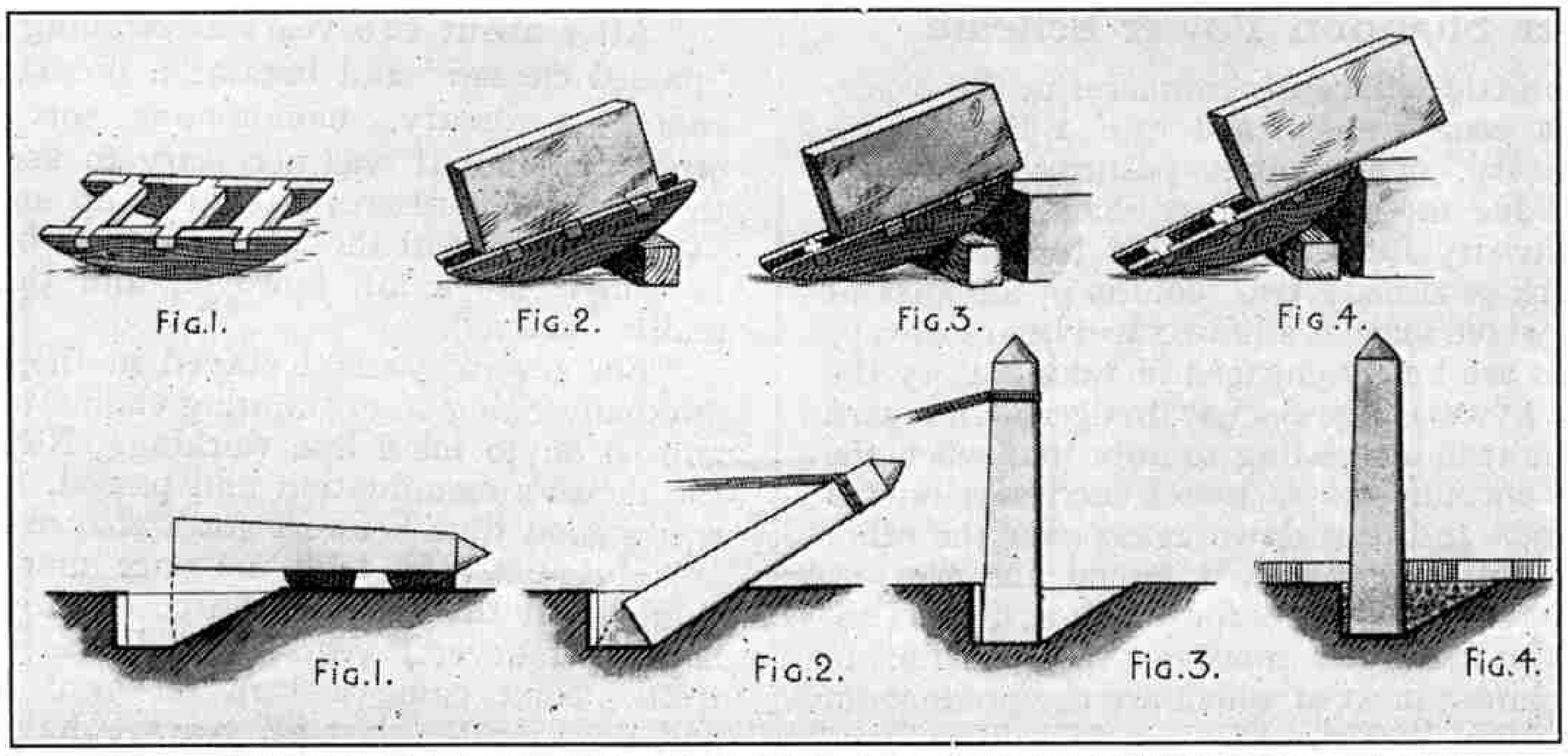
It has been said that the present age is the age of big things, and that the leading civilised nations are indulging in the habit of designing and erecting structures and monuments on a colossal scale. Witness the skyscrapers of New York, which tower many hundreds of feet into the air and of which the famous Woolworth Building, 785 ft. in height with fifty-seven storeys, is typical. Some of the recently erected blocks of office buildings in London also are no mean structures—Adelaide House, at London Bridge, is a mammoth edifice with two warehouse floors, nine office floors and a putting green on the roof. The building reaches a height of 145 ft. and this structure represents a weight of about 30,000 tons, which is carried on 890 piles driven down into the hard clay to a depth of 40 ft. and more. It contains 2,500 tons of steelwork and is covered with 3,000 tons of Portland stone and 1,200 tons of granite. Another wonderful office structure is Bush House in Kingsway, which boasts of eleven working floors and towers 146 ft. in height, the total floor space of this single office building being some 110,000 sq. ft.


Lifting the massive blocks at Stonehenge by a steam-crane

Repairs at Stonehenge

Further striking examples of the feats of the modern engineer are typified by the mighty dams and colossal bridges he has erected throughout the world. Massive and wonderful as some of these structures are, they are, nevertheless, easily eclipsed by the monuments and temples erected many thousands of years ago by men who only possessed the most primitive tools. A little while ago our engineers went over some of the work of the ancient Britons at Stonehenge, raising some of the fallen monoliths and straightening others that were out of the perpendicular. But to handle these great blocks of stone, many of which turned the scale at thirty to forty tons apiece, powerful steam cranes and the latest mechanical lifting devices had to be called into play and even then the task proved difficult. Yet in the dim past these huge stones were fashioned, dragged to the site, and put up by men who knew nothing about the use of iron, or the wonderful power of steam, or about any of the modern methods employed for handling heavy loads.

No one has ever equalled the ancient Egyptians as successful movers of huge masses of stone, however, and the colossal scale of their monuments and temples is largely responsible for having preserved them from the fury of the flood of destruction that again and again has swept through the valley of the Nile.



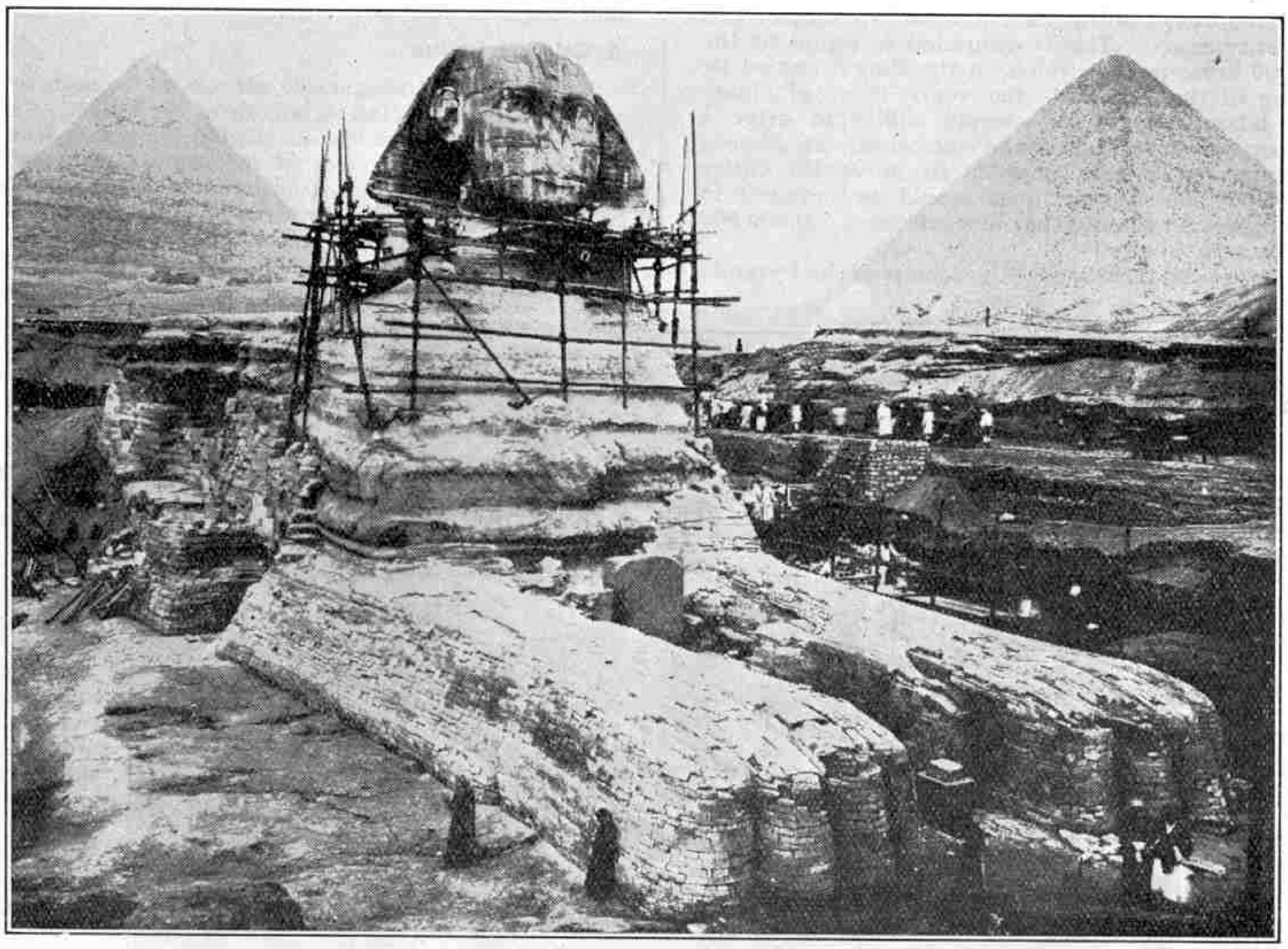
Rocking Sledge, believed to be the chief mechanical device by which the ancient Egyptian engineers built the Pyramids and temples

The Sphinx as a Target

Particular attention has again been called to these wonderful monuments by the recent uncovering of the Great Sphinx. The work was carried out by the Antiquities Department of the Egyptian Government, who are to be congratulated on the successful completion of the task. It enables one to form a better idea of the immense size of this strange piece of sculpture and to picture what it looked like when first erected. All but the head and shoulders and part of the back of the monument were hidden in sand and this was removed by an army of eight hundred Egyptian boys and girls. They worked in gangs and each gang boasted of a singer, who chanted a simple refrain as his fellows passed to and fro with their baskets of debris. Not only has the sand been removed, but masons have devoted attention to the neck, head and face of the monument. No attempt has been made to restore the broken nose or beard which once hung from the chin.

The fact is the Sphinx has been much damaged in the past and it was desirable to make these ravages good. Mohammed Ali used the monument as a target for his artillery practice. Fanatics have tried to destroy its beauty, and a generation or two ago someone chiselled a hole six feet deep in the top of the head in the hope of finding a hidden chamber of gold. A similar hole was bored in the left leg and another in the back of the Sphinx.

This remarkable monument was hewn partly out of solid rock and partly built up with stones. Now that the sand has been cleared away the magnificent proportions of the Sphinx are apparent. From the fore toes to the end of its quarters it measures about 240 ft. in length and stands some 65 ft. in total height. From crown to chin the face measures 33 ft.; the mouth is 7½ ft. across, the nose 5½ ft. in length and the ear 5 ft. in height.


Removing the scaffolding after repairs to the Sphinx. The famous inscribed stone, between the great paws, is clearly seen

Between the huge paws there was formerly a shrine, and here was found the inscribed granite slab, or "stela," set up by Thothmes IV., one of the Egyptian Pharaohs. According to the inscription Thothmes, when a young man, went lion - hunting in the desert and rested at mid-day in the shadow of the Sphinx which even then was half buried in sand. While he slept he dreamed that the sun god Hermachis, to whom the Sphinx was sacred, appeared to him and told him that he would be a king, and laid an oath on him to dig away "the sand whereon I have my being which has closed me in on all sides." The young man came to the throne as Thothmes IV., and one of the first things he did was to dig away the sand and restore the monument.

The Colossus of Ramesis II. at Memphis

Unfortunately, the last few lines of the inscription on the stela are illegible, which is a great pity as they evidently refer to the building of the Sphinx. One gathers, by skipping a few of the gaps, that it was built by Kepheron of the IV. Dynasty, about 3700 B.C., who built the smaller of the great pyramids close by. But another tablet, however, appears to indicate that the Sphinx was standing long before Kepheron's time, when Cheops was busy erecting the Great Pyramid, which would make the monument over 6,000 years old. It is certainly strange that even to-day antiquaries cannot say for certain who actually erected this strange monument, how old it is, and why it was built. All that we know is that it has the form of the Egyptian sun god, which was a crouching lion with a man's head and face.

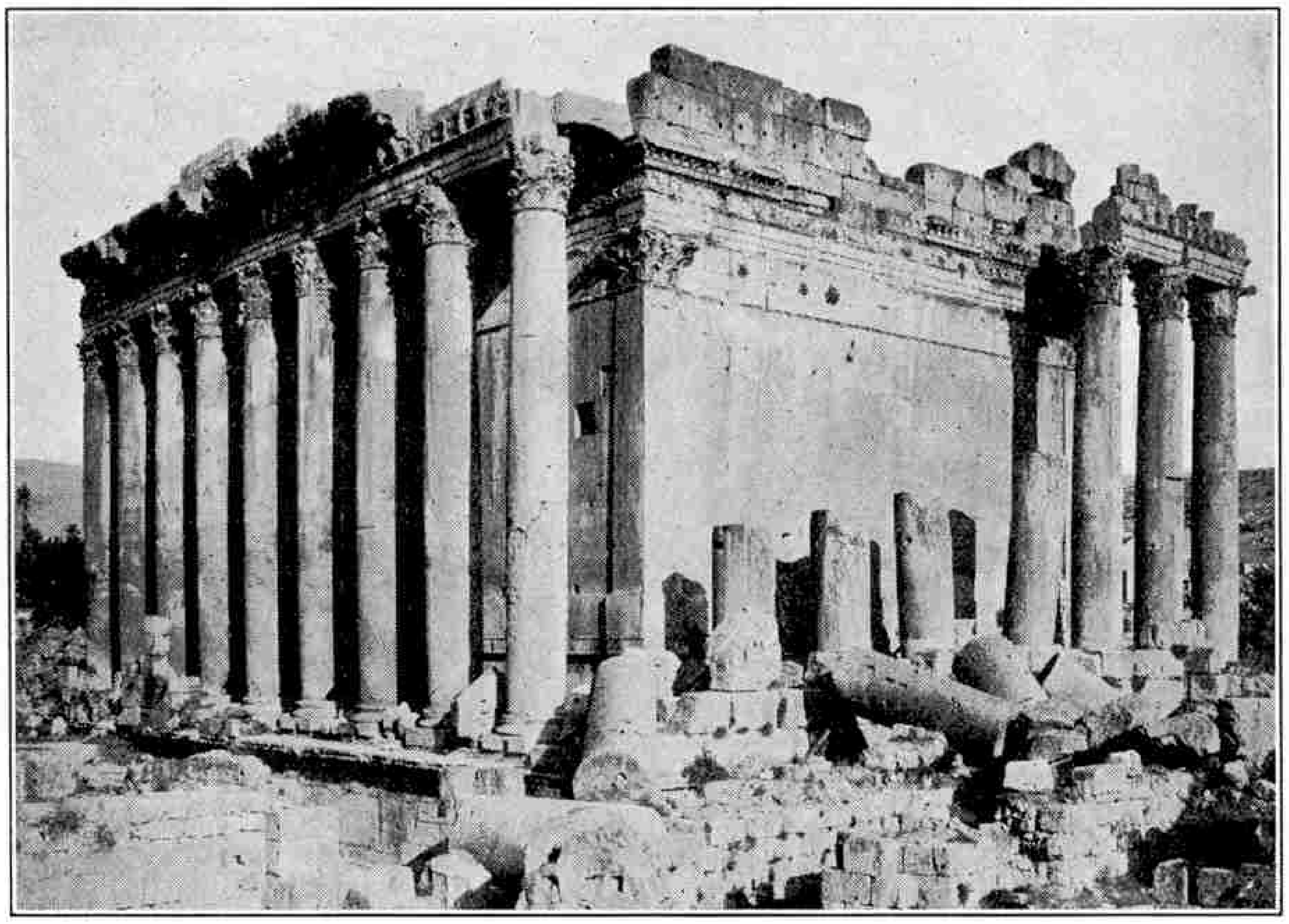
Building the Pyramids

The Great Pyramid, erected by Cheops some 6,000 years ago, can claim the distinction of being the largest of all stone-built erections. It has a base of 764 sq. ft., equal to that of Lincoln's Inn Fields. It originally stood 480 ft. in height, thus exceeding the height of St. Paul's Cathedral by 120 ft. and that of the Capitol at Washington by nearly 200 ft. Although some 4,000,000 cubic ft. of material have been removed from it, there still remains to-day 85,000,000 cubic ft. of stone, representing a combined weight of 7,000,000 tons. Professor Rawlinson has made the interesting calculation that its material would build a city containing 22,000 houses, four and five storeys high, such as are found in an ordinary London square; or, if cut into one-foot cubes, the stones would reach for nearly 17,000 miles—a distance equal to about two-thirds of the earth's circumference at the Equator. There is sufficient material in this single structure to rear half-a-dozen dams like that built at Assuan—the dam is a mile-and-a-quarter in length, 120 ft. in width at the base, 90 ft. in height and 20 ft. in width at the top.

The Great Pyramid is remarkable for more than its mere size, however, for many of the stones of which it is composed turn the scale at forty and sixty tons apiece. The great granite blocks roofing the central sepulchral chamber—for Cheops reared it as his mausoleum—are nearly 19 ft. in length, from 3 to 4 ft. in depth, and 2 ft. in breadth. These stones are fitted together with the nicest care, besides showing in their arrangement a full understanding of the necessity for constructing an arch-shaped roof to withstand the pressure of the huge superincumbent mass. The whole edifice is built with the exactitude that characterises the labour of the watchmaker—the four sides of the base have only a mean error of six-tenths of an inch, and still less in angle from an ideal square !

According to Herodotus, 100,000 men were at work upon this great tomb for twenty years. This is computed to represent the equivalent of 20,000 horse-power, which, in the time occupied by the actual building of the Pyramid—ten years, if we eliminate the nights when labour was stilled—would suffice to drive a 100,000-ton steamer seventy times round the world, at a speed of 20 knots. Supposing it were possible to move the entire Pyramid, over 100,000,000 stalwart men would be required to pull it. Modern engineers estimate that it would cost £30,000,000 to raise such a structure to-day !

We know the greater part of the stones that compose the Pyramid came from the quarries at Assuan. They were quarried from the living rock by means of wooden wedges driven in at intervals along the cleavage line. When soaked with water the wedges expanded and split off the stones, which were then shaped and dressed with chisels and drills of very hard bronze. The quarries lay some eleven miles from the banks of the Nile, and Dr. C. S. Fisher, of the University of Pennsylvania, who has recently spent six years at the head of the archæological expeditions to Egypt, declares that to help them to transport such heavy stones a road was built from the quarries to the river, possessing a smooth surface of pounded stone. The blocks were mounted on sleds and dragged by gangs of slaves to the river side, the road being watered, or possibly oiled, to make it slippery under the sled runners—they had no wheels. Down the river the blocks were floated on rafts to be dragged finally to the building site.



Ruins of the Temple of Bacchus at Baalbec, Syria. This building contains the largest squared blocks ever used

How the Ancient Engineers Moved Masses of Stone

The most important of Dr. Fisher's discoveries is the form of the sleds on which stone blocks were moved. They were, he believes, shaped like the base of a rocking horse. By driving wedges under one end of a block it could be raised sufficiently to allow an end of the rocker to be inserted under it. The block could then be hauled and levered further on to the sled until it balanced on the centre. The rocker sled was not only the easiest way of getting a block off the ground and the easiest to haul, but it also made possible the lifting of the block to any height.

How this was accomplished is illustrated in the accompanying sketches. One end of the rocker is depressed and the other end is wedged up. The stone is hauled over the raised end so that it overhangs another stone or a platform of false work. On this a second rocker sled receives the stone. In this fashion pyramiding of large blocks became simpler than by constructing an inclined way up which they were laboriously dragged—the most commonly accepted theory of the Egyptian method of erection. And the rocker also made it possible to raise the blocks vertically for wall-bearing. Either end of the rocker could be elevated in turn and the stone levered up step by step backwards and forwards, a platform of false work being built up under it at each step. Such a method entailed immense labour, but it saved enormously in material compared with the inclined-way method.

Dr. Fisher also discovered in the temples at Gizeh the method employed by the ancient Egyptians for elevating the huge monolithic columns found all over that country. Where a column was to be placed a square shaft was excavated with three sides vertical and the fourth, the side facing the direction from which the block was to be dragged, cut away in a long slope. The block was then dragged up on sledges until its base was in position over the hole. With ropes to the top and wedges and levers below, the block was tilted up until it rested on the slope with its base in the hole, and was then hauled to the vertical and the hole filled in and the floor slabs laid down. The slope made the labour easier and also saved any serious jarring of the stone as it entered the hole and rose into position.

A Colossal Statue

Some of the most notable objects to be seen in Egypt are the mighty statues erected in honour of her kings. At Memphis, near Cairo, there is an enormous statue, known as Rameses II. It is hewn from a single piece of red granite, is sixty feet in height, and its weight has been computed by Sir K. Gardner Wilkinson, at 887½ tons. This great statue is lying on its back, supported on stone pillars amid the palm trees. It is declared to be the property of the British nation, and some two years before the great war, the then ruling Khedive thought he would show some respect to the British people by having the statue raised at his own expense. So he sent for one of the army engineers and instructed him to place the monument in an upright position before one of Egypt's ancient temples. The engineer looked over the monument, took certain measurements, and promptly decided that the task was beyond him. So it was, unless the very latest cranes and the most powerful tackle could be requisitioned, and many months spent on the work. Yet we know from ancient records that the block from which this single monument is carved was cut in the quarries at Assuan, rolled on to rafts, and floated down the Nile to Cairo, there to be dragged ashore, laboriously carved and set up.

One could write at great length on Egypt's ancient monuments which dot the whole of the lower Nile Valley. At Thebes we have the remains of temples whose forms and whose columns were the origin of early Greek architecture, and therefore of all the architecture of the classic world. There is the Palace Temple of Karnak, the Temple of Luxor, the Memnonium, and the Tomb of Osymandias.

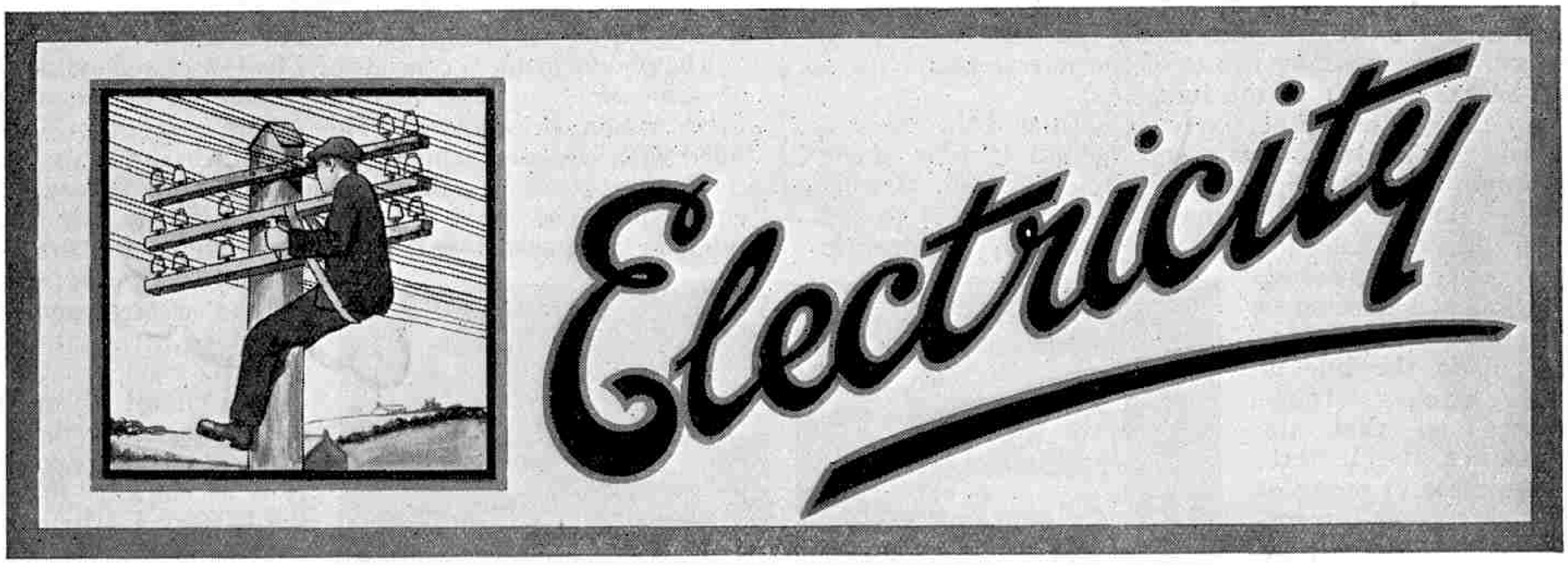
The Largest Building Stones in the World

The approach to the Temple of Karnak is through an avenue of sphinxes. Only fifty of these massive monuments out of the original six hundred are now standing. This wonderful edifice was 1,200 ft. in length and 420 ft. in breadth. The great hall was 330 ft. in length and 190 ft. in width, or larger than Cologne Cathedral. Some 130 columns were needed to carry the roof, these columns being each some 70 ft. in height, and having a diameter of 11 ft. The capitals are in the exquisite form of the lotus flower, and the carvings that adorn some of them are quite distinct to-day.

The Tomb of Osymandias was certainly a colossal edifice, being virtually a palace, library, and mausoleum combined. It was a mile-and-a-quarter in circumference, and was adorned with sculpture of the greatest excellence. The tomb itself was of immense size, and boasted of three giant statues, cut from a single stone. Only two, known as the Colossi, remain, and they each tower 60 ft. in height. They must each be several hundred tons in weight, and one marvels how those ancient builders managed to transport and erect them.

Among the wonderful ruins of the Temple of the Sun, at Baalbec, in Syria, may be seen the largest squared stones ever used for a building. In one of the walls, at a height of 19 ft. above the level of the ground, are three monster blocks, all over 63 ft. in length and 13 ft. in height. Their width is

(*Continued on page 629*)



XXXI. TELEVISION

In last month's "*M.M.*" it was seen that to transmit a picture from one place to another by means of wire or wireless it was first necessary to split it up into a large number of parts, each of which was sufficiently small to be considered to be of equal brightness or darkness over its whole area. This brightness or darkness of each part must then be translated by means of a light-sensitive electric cell into an electric current of corresponding strength, which would be sent to the receiver and there reconverted into light.

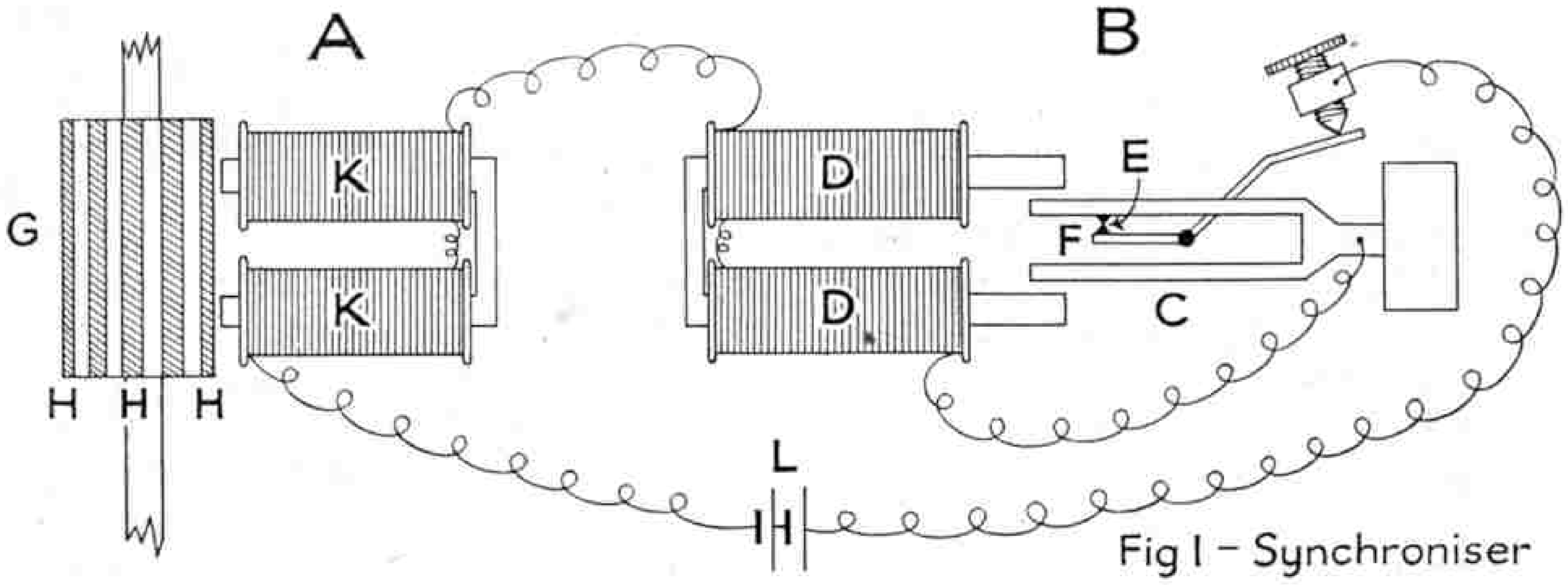


Fig I - Synchroniser

It was also seen that to obtain satisfactory moving pictures by television it was preferable for all the small parts of the whole picture to be transmitted all the time, but that this was practically impossible, and that some switching device was necessary to reduce the number of lines connecting the transmitter to the receiver.

The majority of attempts at the solution of television are attempts to design such a switch, capable of making thousands of contacts or movements a second and yet of remaining in step with another switch at the other station making the same number of contacts or movements.

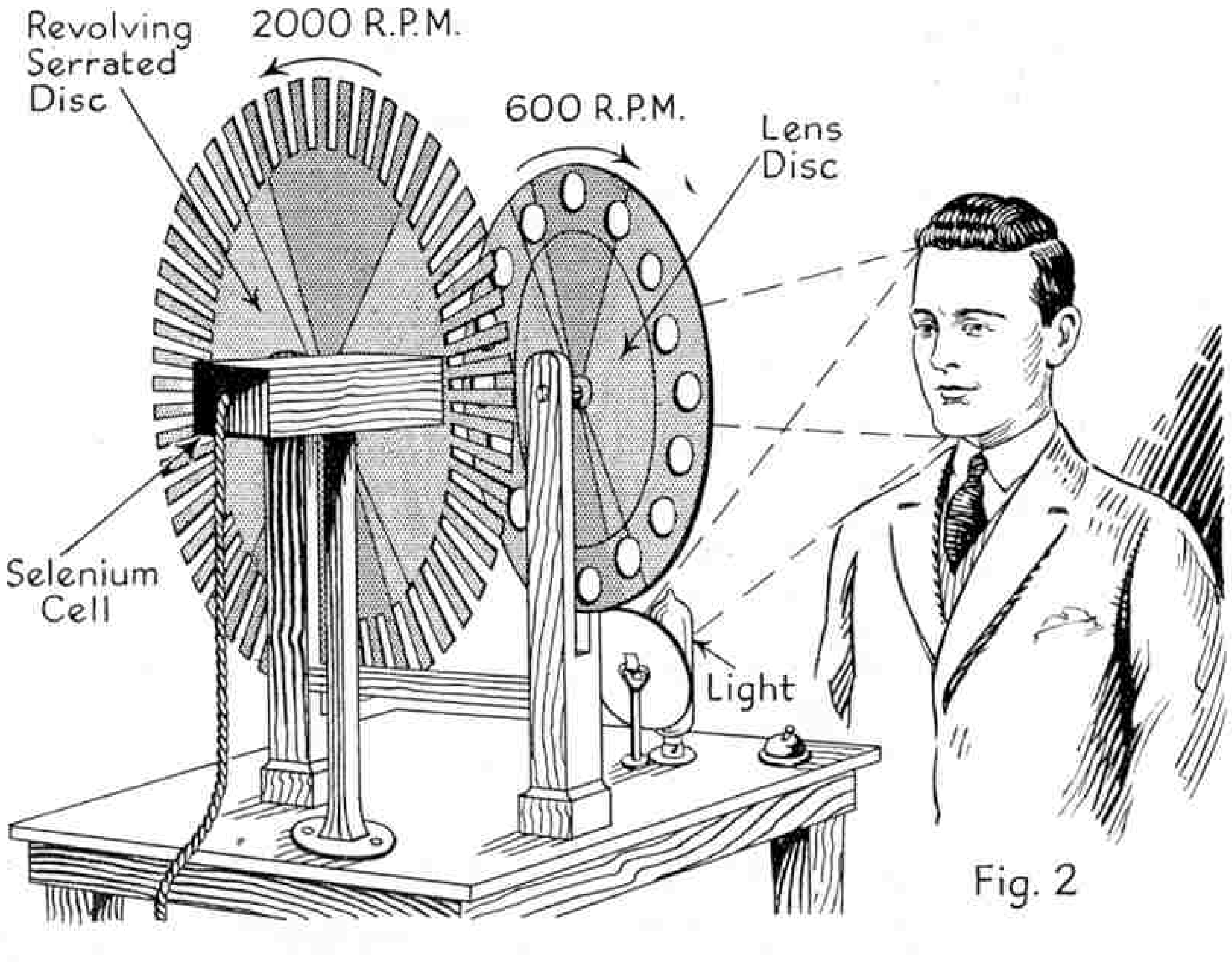


Fig. 2

Very few of these switches rely upon mechanical contact and they may roughly be divided into two classes. The first class contains those switches that cause all the small portions of the picture to act upon a single light cell in turn, so that one cell only is employed; the second class consists of switches that still make use of a large number of cells, but connect each of them in turn with the line or wireless transmitter.

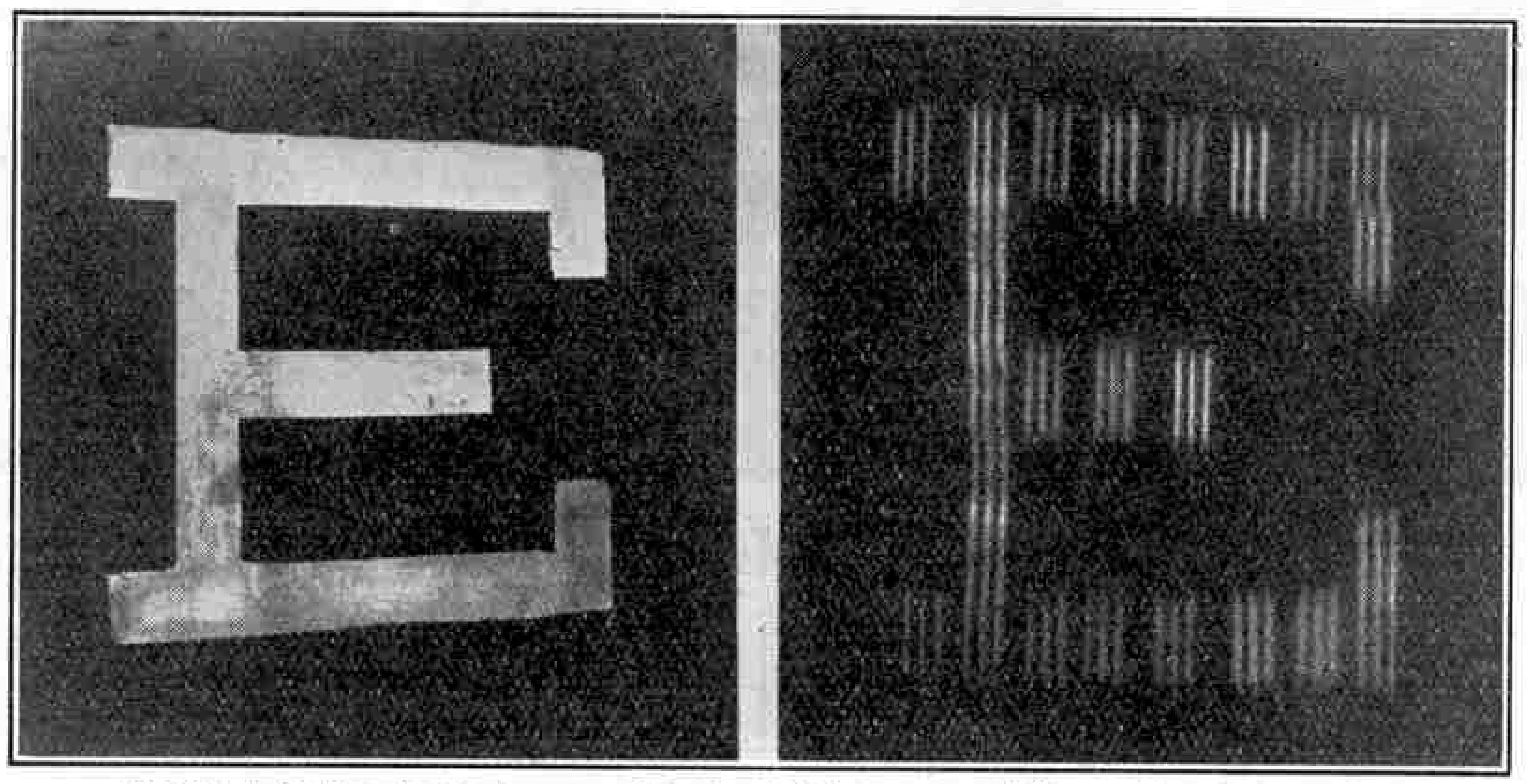
Mihaly's System

One of the most interesting mechanisms of the former class is the so-called "Telehor" invented by Dionys Mihaly, an Hungarian engineer of Budapest. This arrangement was first constructed and experimented upon about 1916, and it has given some very remarkable results when using wireless for the transmission.

The apparatus relies upon a double movement given to a mirror only one square millimetre in area. One movement causes it to turn backward and forward at the rate of five hundred times a second, while the other movement causes it to turn to and fro in a direction at right-angles to the first movement, at the rate of five times a second.

The light rays from the object to be transmitted are brought to a point by means of lenses at the surface of the mirror, which reflects them on to a screen. Since the mirror is continually moving as described, the reflection is also moving, the two movements of the mirror producing a zig-zag movement of the image.

In the centre of the screen is a small hole about a square millimetre in area and behind it is a single selenium or other light-sensitive electric cell. Owing to the movement of the image, every part of it passed over this small hole, and therefore acts upon the selenium cell, ten times a second. The cell is connected to amplifiers which are connected to the line or the wireless transmitter, so that the whole of the picture, in the form of pulses of electric current, is transmitted ten times a second.



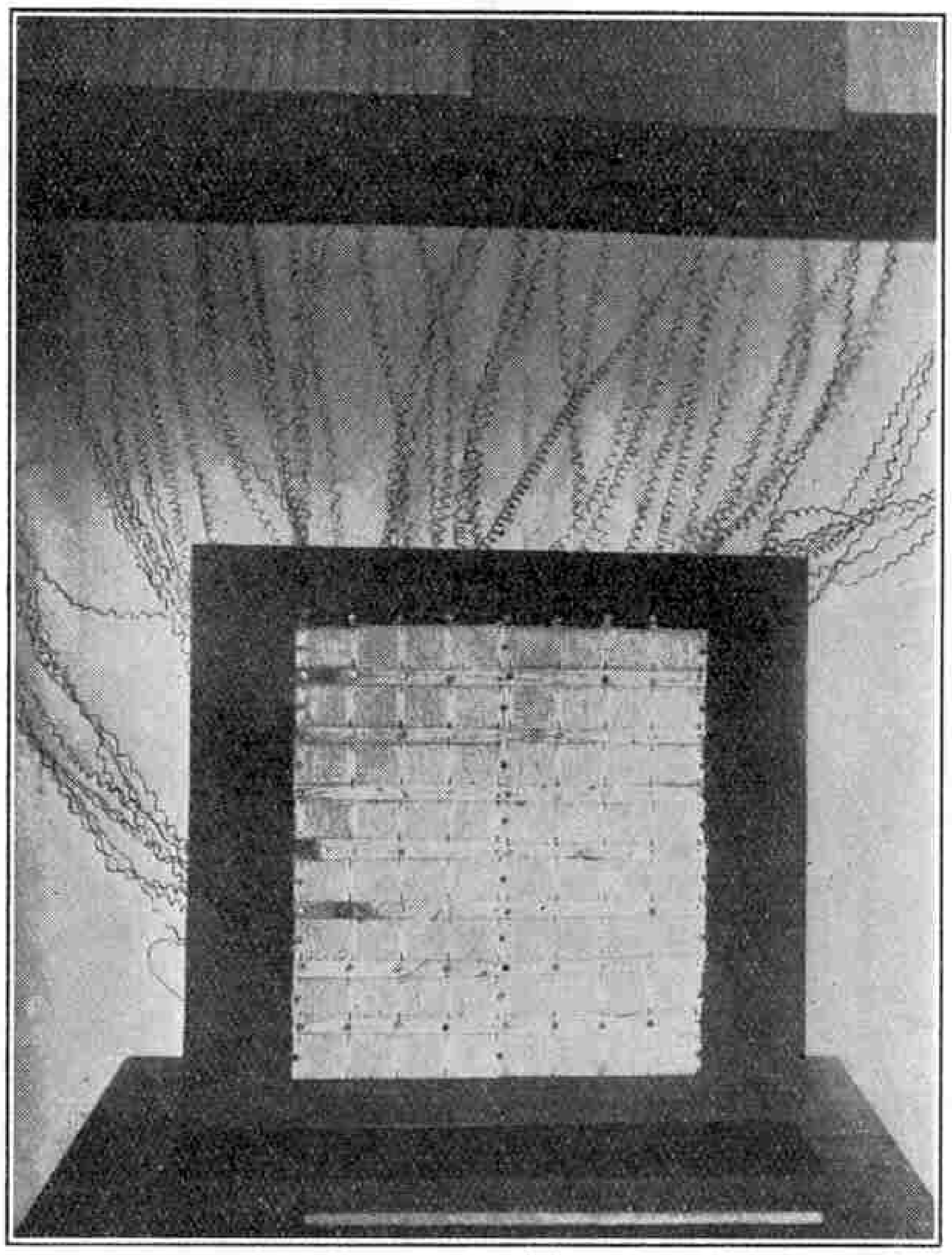
(Left) A letter to be transmitted : Rignoux and Fournier Apparatus
(Right) Same letter as received

At the receiving station the reverse process takes place. In a position corresponding to that of the selenium cell of the transmitter there is an electric lamp in front of which is a suitable shutter controlled by the current pulses received from the transmitter. The ray of light, having passed the shutter, falls upon a mirror having movements identical with those of the original mirror in the transmitter and thus the light ray, fluctuating in strength in accordance with the transmitted signals, is distributed in a zig zag path over the whole of the ground-glass screen ten times a second. In this manner the original picture is reproduced.

Need for Synchronisation

It will be obvious that, for the successful working of this system, absolute synchronisation between the two oscillating mirrors, one at each station, is most essential. A special piece of apparatus is employed to obtain this and, since similar apparatus is used in very many other forms of television transmitters and receivers, we propose to describe it in detail.

The object of the apparatus is to make a rod revolve at an absolutely constant speed, so that another rod on another identical synchroniser at the receiver will keep "in step" with the first rod when once set. As used by Mihaly it consists of what is known as the "phonic drum" (A, Fig. 1) invented by J. L. La Cour, combined with a tuning fork interrupter B. The tuning fork C is firmly mounted at its base, and the ends of its legs, which are magnetised, are placed between the poles of an electromagnet D. On one of these legs there is a contact E, which is normally touching the fixed contact arm F. This arm is adjustable by means of the screw shown.



Frame of Selenium Cells showing connection wires : Rignoux and Fournier Apparatus

The phonic drum G consists of a hollow closed cylinder of some non-magnetic material, mounted on an axle upon which it revolves. The cylinder is often half filled with mercury, which acts as a flywheel and makes it motion steadier. Round the drum are placed at equal distances apart a number of soft iron bars H, lying in a direction parallel to the axle of the drum. These bars pass in front of the electromagnets K, which attract them in turn.

The circuit through the tuning fork interrupter and the magnets K is as shown. From the battery L, the current flows via the adjusting screw, the contacts F E, to the tuning fork C, which leaves by way of the base. It passes through the coils of the electromagnets D, and of the magnets K, whence it returns to the battery L.

When the current flows, the magnets D attract the magnetised legs of the tuning fork and pull them slightly apart. In doing so the contact E F is broken, the current stops and the legs of the tuning fork spring back to their original position, when the process is repeated. It will be seen that this action is very similar to that of an electric bell and, owing to the fact that a tuning fork will only vibrate at its own frequency, the fluctuating current set up in the circuit is, therefore, very accurately-timed.

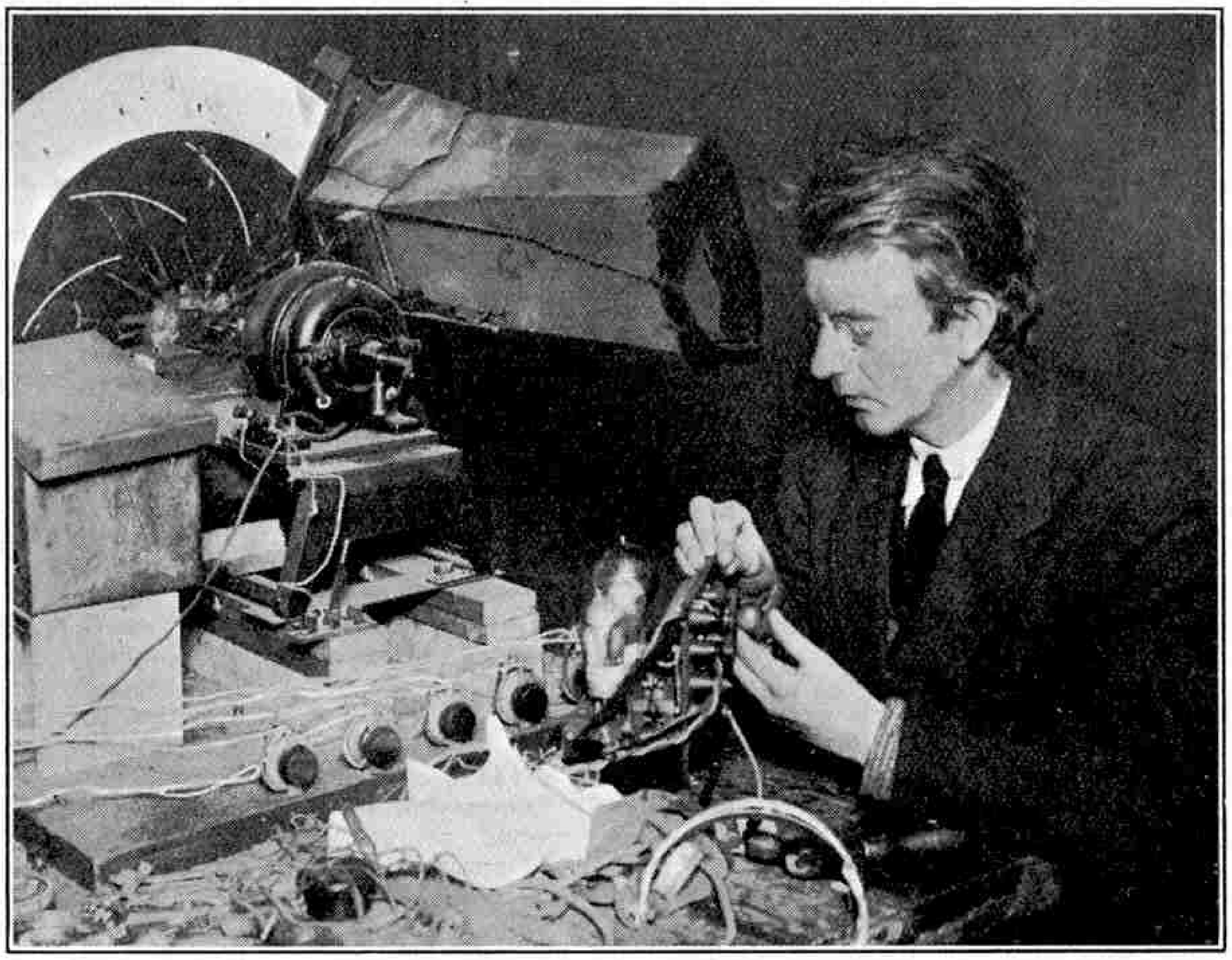
At each pulse of current the magnets K, which as has been said already, are included in the circuit, attract one of the bars H on the drum G and cause the latter to revolve. Thus one bar passed the magnets K for every pulse of the current and consequently the drum G, revolves at a constant rate.

If two tuning forks are accurately tuned to vibrate at the same rate they may be used in two such synchronisers, one at each station, which will keep in time with one another for several hours without adjustment. In the Mihaly system the apparatus is arranged so that the drums complete five revolutions every second and these control the movements of the mirrors.

Using Streams of Electrons

Another system, which has met with about the same amount of success as the Mihaly system, is that invented by Mr. A. A. Campbell Swinton, F.R.S. This system contains no mechanical moving parts with the exception of two current generators that rotate continuously.

It is a well known fact that streams of detached electrons which are particles of negative electricity, may be obtained comparatively easily in an apparatus known as a Crookes tube. These cathode beams, as the streams of electrons are termed, normally travel in straight lines, but they possess the power of being deflected when under the influence of a magnetic field. Also, since they consist solely of negative electrons, they produce the effect of an electric current.



Mr. J. L. Baird adjusting his Transmitter

Swinton's transmitter consists of a Crookes tube arranged so as to give a narrow beam of cathode rays crossing a magnetic field produced by two electromagnets and coming to an end on a wall consisting of a large number of cubes of metal insulated from one another. The two magnets causing the magnetic field traversed by the cathode rays fluctuate in strength, one at the rate of a thousand times a second and the other at the rate of ten times a second. They are set at right-angles to one another so that they cause the cathode rays to trace out a zig-zag path on the metal cubes, in the same way as the image and light rays oscillate in the Mihaly transmitter. In this case, however, the vibrating parts—the cathode rays—have practically no mass and therefore are able to move to and fro much more easily, rapidly and precisely.

On the far side of the metal cubes from the cathode rays is a chamber containing a gaseous vapour, usually sodium, which possesses the property of transmitting negative electricity more readily under the influence of light than in the dark. The image of the object to be transmitted is brought to a focus on this side of the metal cubes. Each cube receives a change of negative electricity from the cathode rays every time the latter fall upon it and if the cube is lit by the image this charge immediately flows to line and the receiving station. If, however, the cube is not lit, then the charge remains upon it and little or no signal current goes to the receiving station. It is thus seen that a pulse of current will be sent to the distant station from each cube in turn, its strength depending upon the brightness of the portion of the image falling on that cube at the moment.

Thus this instrument falls into the second class mentioned at the beginning of this article, in that it consists of a large number of what are practically light-sensitive cells, each of which is connected in turn to the line by means of the cathode ray "switch."

The receiver consists of a somewhat similar apparatus in which cathode rays of varying intensity, according to the strength of the signal current at the moment, fall upon a fluorescent screen, that is, a screen that "glows" when cathode rays impinge upon it.

The Belin System

Most systems of television so far devised have made use of a single light-sensitive cell upon which the different parts of the picture are caused to act in turn, as in the Mihaly system.

In the Belin system, for example, a source of light is refracted by means of a bull's eye lens into a parallel beam that falls upon a disc of metal in which a spiral of small holes is punched. This disc revolves at a rate of at least ten times a second and, since the light shines through each of the holes in turn, a rectangular screen is covered with light at corresponding intervals.

This screen is transparent but is graduated so as to possess bands of different degrees of transparency, as do different parts of a photographic negative, and each of these parts is illuminated by the light in turn. Passing through the screen, the light rays enter a photo-electric cell where they are translated into a corresponding electric current.

This current is transmitted to the receiver, which is very similar to the Mihaly receiver, although apparently not so elaborate. The variations are reproduced on a white screen at the receiver, and it is possible to transmit moving pictures by replacing the screen of the transmitter by a cinematograph film, the pictures of which are transmitted one at a time and stepped forward in the usual manner.

It will be seen that this system really consists of transmitted shadows cast by a semi-transparent object, and while suitable for the purposes for which it is intended, it is not capable of sending pictures of actual objects, which should be the ultimate aim.

Promising British Invention

One of the most promising television inventions is the result of Mr. J. L. Baird's investigations in his London laboratory. As first designed his system was only capable of transmitting shadows cast by opaque objects placed in the path of light rays that were focussed upon a single selenium cell, but recently improvements have been made in various parts of the apparatus so that now it is able to transmit remarkably good pictures of illuminated objects. In fact so successful has been the improved instrument that on the 27th January last Mr. Baird was able to give a demonstration before the members of the Royal Institution during which a very good picture of a human face was reproduced on the receiving screen when a person stood before

(*Continued on page* 629)

RAILWAY NEWS OF THE MONTH

L.N.E.R. Scottish Notes

During the first week of last month, the engines on the Edinburgh-Glasgow road included "Directors" 6381/2/3/5, "Pacifics" 2566/7 (both fresh from Cowlairs shop), while the "Lothian Coast Express" had 9424 "Lady Rowena."

The Lothian Coast Express has been in charge of various engines this year. On the first day it ran, No. 9417 "Cuddie Headrigg" brought it into Edinburgh and 4-4-2 No. 714 (N.E.R. Class Z) worked it through to Glasgow. Subsequently, however, Director No. 6401 and Pacific No. 2567 have been seen on it, while No. 9360 "Guy Mannering" brings it from North Berwick to Edinburgh.

* * * *

Almost all the Directors have now been repainted and have had their framing cut down. No. 6388 was the last to receive her name and was seen on 12th July. No. 6387 appeared six weeks earlier. Those yet to be repainted and overhauled are 6393/4 (Dundee) and 6389, 6390/1/2/9 (St. Margarets), which are already named. Perth Shed is noted for the cleanliness of its engines and 6387/8 are easily the cleanest "Directors," and 9418 "Dumbiedykes" and 4-4-0 No. 9639 are among the cleanest engines of their classes.

* * * *

G.N.R. 4-4-0's No. 3051-3065, which were sent to Scotland about a year ago, are being fitted with Westinghouse brakes, thus enabling them to work all kinds of passenger and fish traffic. The pump is placed just outside the smoke-box on the left-hand side. Those treated include, 3051/7/9.

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This year the "Fife Coast Express" is brought into Edinburgh by 9149 "Glen Finnan" (Thornton Shed) and the return run is taken by 9362 "Ravenswood." The train is a four-coach corridor set.

* * * *

The engine damaged in the recent collision at St. Margarets during the strike was 4-4-2T No. 9450. Another derailment during the strike was No. 9415 "Claverhouse," due to a volunteer driver taking her backwards over a runaway catch-points.

No. 2565 "Merry Hampton," derailed near Newcastle, has not yet returned to Edinburgh where she is shedded.

* * * *

Recent engines re-built with super-heaters include Scotts Nos. 9244, 9340, 9895/8. Class "K" Intermediates, Nos. 9884, 9891, 9332, 9894. An innovation is the painting of "K's" green, instead of black as previously. Those repainted green are 9883/4/6, 9891, 9331/2/3, 9867. 9331/3 and 9867, are un-rebuilt. 9894 was painted black before the idea of green was inaugurated. Scotts Nos. 9245 and 9361 have been fitted with screw reversing gear (G.C.R. pattern).

* * * *

Interesting engines still running are: Scott 9895. Tender lettered L. & N.E.R. Scotts 9414 and 9426. Tenders lettered L & N E R 4-4-0 No. 597B—one of the few survivors with "B"—the first step to distinguish engines of the various groups. 4-4-0 No. 9579. Old N.B.R. colour, new lettering on tender and new number plate on cab.

* * * *

L.M.S.R.

A repaint on this line is 14430 old No. 766, the pioneer of the "Dunalastair II." Class and *temporarily* named as such. McIntosh 4-4-0, No. 141, Dunalastair I., 4-4-0, No. 728 and Pickersgill 4-4-0, No. 67, are among the very few Caley passenger engines still running in their old colours.

* * * *

Quick Bridge Building

The electrification scheme on the South-Eastern section of the Southern Railway has necessitated the construction of a new railway bridge across Rye Lane, Peckham, and recently this was placed in position. One Saturday midnight traffic along the road was diverted and immediately a large squad of navvies began to pull down the old bridge. By the Sunday night all the new girders had been lowered into position and at 7.30 on the Monday morning the new bridge was open to traffic.

* * * *

The L.N.E.R. have ordered two Sentinel-Cammell coaches and 34 all-steel luggage brake vans from Cammell Laird & Co. Ltd. of Nottingham, and four articulated trains, 32 coaches in all, from the Midland Railway Carriage and Wagon Co. of Birmingham.

* * * *

Italian Railway Electrification

Important contracts have been placed by the Italian railway Ferrovia Nord, which recently decided to electrify a section of its suburban system. The work to be put in hand includes a sub-power station at Novate, and the electrical equipment of eight 4-axle motor coaches and eight trailer coaches provided with drivers' cabs. The trains used on this section will consist of a motor coach, two or three ordinary trailers and at the rear a trailer fitted with a driver's cab, thus affording control from both ends. The maximum speed of a fully loaded train will be approximately 60 miles per hour, but working to normal schedule the average speed will be about 33½ miles per hour.

An electro-pneumatic safety control apparatus will be provided on all trains for the purpose of automatically bringing the train to a standstill in the event of an accident to a driver. By means of a timing arrangement this automatic device will come into operation only after a certain distance has been covered, so that a train will not be stopped unnecessarily if the driver happens to leave his post for a few moments.

* * * *

New G.W. Signalling Installation

The large signal cabin on the Taff Vale section of the G.W.R. at Cogan Junction is to be scrapped, and a smaller box fitted with only 50 levers is to be erected. The siding movements, previously conducted from the signal box, will be performed by hand. New signal posts of concrete are being constructed and the "somersault" signals at present in use will be abolished when the installation is complete.

* * * *

Wireless Telephony on Trains

A service of wireless telephony has been installed on four of the express passenger trains running between Berlin and Hamburg and a similar service is to be installed on trains using the Berlin-Munich route. The German Railway Commission have had this matter under consideration for some time, and it is probable that in the near future a wireless telephone service will be provided on all express trains on the principal routes.

* * * *

Increased Rail Weights

The introduction of heavier locomotives always involves strengthening the permanent way, and it is interesting to observe the steady increase in weight of the rails employed on American tracks. In 1830, rails weighing 35 lb. per yard were usual. By 1914 the average weight was 90 lb. per yard, while to-day rails of 130 lb. to 136 lb. are being used extensively. Last year, out of a total weight of 2,800,000 tons rolled, less than 6 per cent. was for rails lighter than 60 lb. and nearly 60 per cent. was for rails exceeding 100 lb.

* * * *

"Distant" Signals to have Yellow Arms and Lights

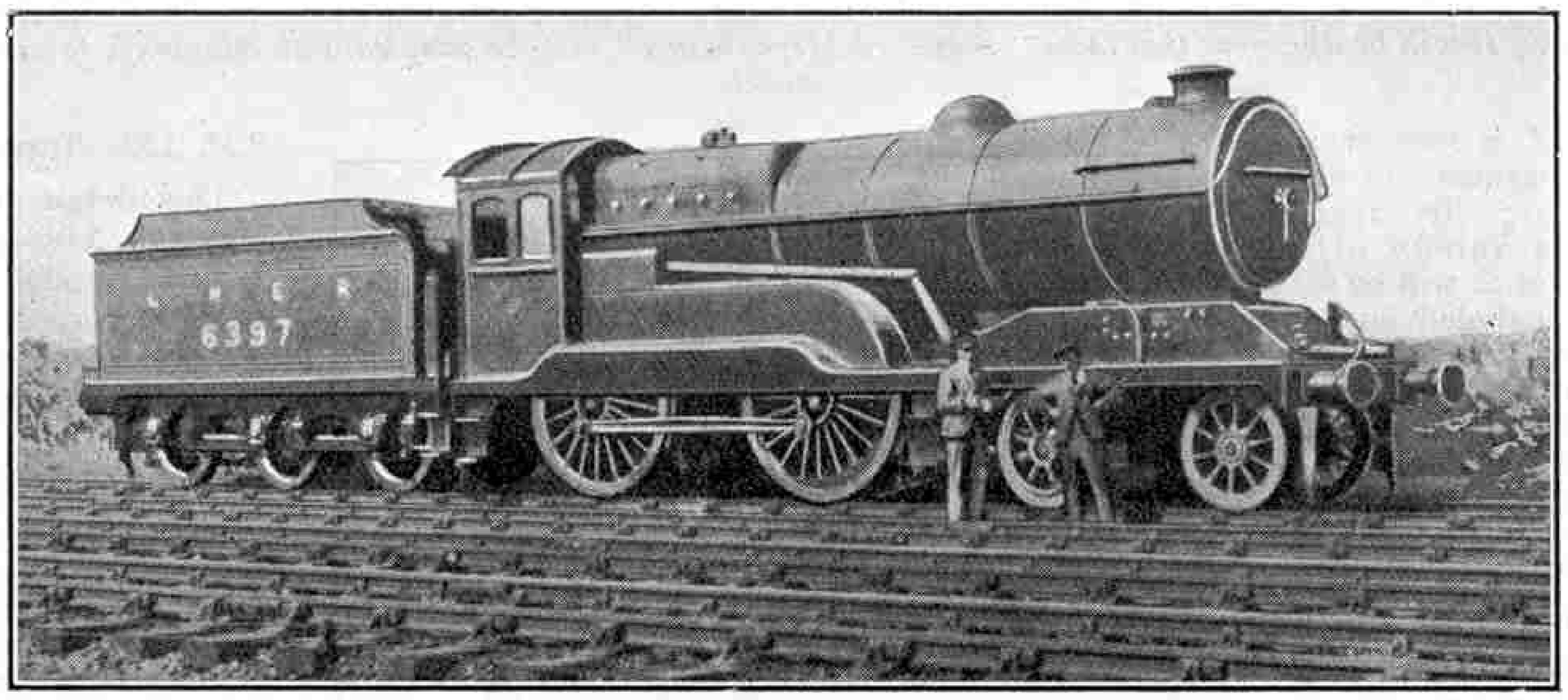
New regulations of the Ministry of Transport require all railway "distant" signals to be fitted with yellow arms and lights. On the Great Western Railway yellow lights have already been introduced between Paddington and Southall, and during the present year the signals as far as Bristol and Birmingham will be completed.

Loco Notes from Leeds

(From our Railway Correspondent)

With the exception of new Midland type compounds, the L.M.S. locomotives working in and about Leeds compare unfavourably in the matter of appearance with those of the L.N.E.R. It is common to see black locos of the former L.N.W.R. coupled to red tenders, and vice versa, while only an occasional 4–6–0 " Prince " attracts attention by its polished appearance.

"The Lady of the Lake"



L.N.E.R. " Director " No. 6397 at Haymarket, Edinburgh. Unnamed and with framing uncut. Now named " The Lady of the Lake " and has cut framing. Photo sent by J. Millar Craig

Western Section locos working from the New Station include "Princes," " Georges " and occasionally older non-superheated passenger classes. Local trains to Huddersfield and Marsden are almost invariably hauled by 0–6–2 tank engines with 5ft. coupled wheels, No. 656 of this class (Crewe number) doing much of the station shunting. A Class " G " 0–8–0 mineral engine is also to be seen occasionally. " Claughtons " are rare visitors, but the West of England night mail from the North Eastern line is sometimes headed by 150, " Illustrious."

* * * *

A " Featherweight " Express

A curious feature is the nightly departure of a single brake van with mails and newspapers. This runs to Manchester on a fast schedule and is invariably taken by a " Prince of Wales " or 19-inch 4–6–0 mixed traffic loco. On a recent evening, this featherweight express was taken out by one of the latter class, while from the adjacent Midland Section Station a Bristol and Swansea express, consisting of no less than 13 carriages and mail vans, started nonchalantly behind a Midland rebuilt loco of moderate dimensions and respectable age.

L.N.E.R. traffic is worked by most of the older 4–4–0's which, however, are kept very spick and span and always appear to be extremely comfortable to drive. The large-boilered Class " R's " and " R 1's " are much in evidence, as are the large three-cylindered 4–4–4 tanks. " Pacifics " from York work a turn now and again, but " Atlantics " are common.

Some of the older Midland 2–4–0's and 0–4–4 tanks on view at the Wellington station have been rebuilt with standard fireboxes and " Pop " valves. One regrets the passing of the time-honoured " Salter " spring valves on the dome and the elegant brass lockup valve on the firebox, but it is satisfactory to know that the veterans are likely to see many years' service in their more up-to-date guise. A large number of 4–4–0's burn oil and the turning on of the jets leads to an awe-inspiring rumble and quiver.

Locos from Many Sources

At the Central Station, L. & Y., L.N.W., G.N.R., G.C.R., N.E.R., and L.N.E.R. locos may be seen, so that in the course of an hour's tour of the three Leeds stations it is possible to see and compare locos originating from Horwich, Crewe, Gorton, Doncaster, Darlington and Derby.

Bradford suburban trains are largely worked by G.N. 4–4–2 and 0–6–2 tanks, all of which seem to possess in an unusual degree a proclivity for burning their smokeboxes. Great Central 4–6–2's of the " Wembley " Tank Class—very handsome and efficient engines—do their share of the work. Expresses to King's Cross and the G.N. line are mostly taken out by Doncaster " Atlantics " (including the booster-fitted one), Gresley 2–6–0's—irreverently christened the " Ragtimers ! " —and Great Central 4–6–0's of the " Immingham " type. The last-named seem most at home in breasting the steep gradient from the Central Station past Holbeck. L. & Y. 4–4–2's, 0–6–0's, and 2–4–2 tanks are the usual representatives of that section.

London to Harrogate expresses are generally taken on by a North Eastern 4–4–0.

* * * *

Spanish Railway Activities

Despite the great flourish of trumpets when the new railway statute was approved by the Spanish Government last year, the progress recorded to date in the re-organisation and modernisation of the systems has been very small. The Government have issued loans to the companies to enable them to purchase new rolling stock and to overhaul the permanent way, and an interesting feature of this scheme is that all material and stock purchased must be of Spanish manufacture. This, of course, is the outcome of the active interest taken by the Spanish steel industry.

In addition to the assistance thus afforded to the existing systems, several new lines are to be constructed. These will be principally links between existing main lines and suburban systems outside the principal cities.

Work is going ahead steadily on the two underground systems in Barcelona and both will be completed shortly.

" Double-Deck " Rail Coaches

An interesting experiment in the employment of double-decked passenger coaches is to be made on the Capetown suburban lines of the Union of South Africa Railway. In appearance the coaches will be very little different from ordinary tramway passenger vehicles. Accommodation will be provided for 120 passengers, 24 seated in the vestibules at each end of the coach and 48 on each of the upper and lower decks.

The seats on the lower deck will be arranged along the sides of the coach, facing a central gangway, and on the upper deck the seats will run the length of the car but will be placed back to back. The dome-like space between the seats on the upper deck will be used to provide headroom for standing passengers on the lower deck, and head clearance on the upper deck will be gained by sinking its floor sufficiently in the space immediately over the lower deck seats.

Each coach will be 62½ ft. in length, 9 ft. 1¾ in. in width, and 12 ft. 8 in. above rail level. This height may appear surprisingly small in view of the nature of the coach, and the explanation is that the coach floor is placed below the axle level between the wheel trucks.

* * * *

New Locos for Buenos Aires

Two 4–6–2 two-cylinder superheater locos, the first portion of an order for twenty similar locos for service on the Buenos Aires Great Southern Railway, were recently conveyed by the L.M.S. from the Vulcan Foundry, Newton-le-Willows, to Liverpool for shipment. The total weight of the consignment was approximately 400 tons. Bogie vehicles were used to carry the locos, each of which weighed approximately 22 tons and was 38 ft. 7 in. in length and 10 ft. 3¼ in. in width. The tenders, each 26 ft. 6 in. in length, 10 ft. 2½ in. in width and weighing 13½ tons, were carried in well wagons. The maximum height of the load was 11ft. 10 in. above the level of the rails and the width was such as to block the adjoining line.

* * * *

Castings for Sydney Bridge

The use of seventeen special wagons was necessitated recently when the four huge bearings upon which will rest the main span of the new bridge over Sydney Harbour were transported by the L.N.E.R. from the Darlington Forge to Middlesbrough Docks for shipment to Australia, per the S.S. " *Adelaide*." Each of the bearings is over 300 tons in weight.

MECCANO STANDARD MECHANISMS

Section IX. Screw Mechanism

This article is the eleventh of a series explaining some new and interesting aspects of Meccano model-building practice. Previously we have dealt with Gear Ratios, Belt Mechanism, Pulleys, Levers, Clutches, Drive-Changing Mechanisms, Brakes, Bearings, Steering Gear, etc., and the following article describes some of the interesting movements that can be obtained with the aid of Meccano Threaded Rods. It will be apparent that these " Standard Mechanisms " may be adapted with advantage to numerous Meccano models.

THE Threaded Rod is one of the most useful features of the Meccano system; it readily lends itself to a wide variety of ingenious movements, and as will be seen from the examples included in this section, it enables some very important mechanical movements to be reproduced with detailed accuracy. It also proves invaluable as a method of increasing the available power, although at a considerable loss of speed, in order to cope with exceptionally heavy loads.

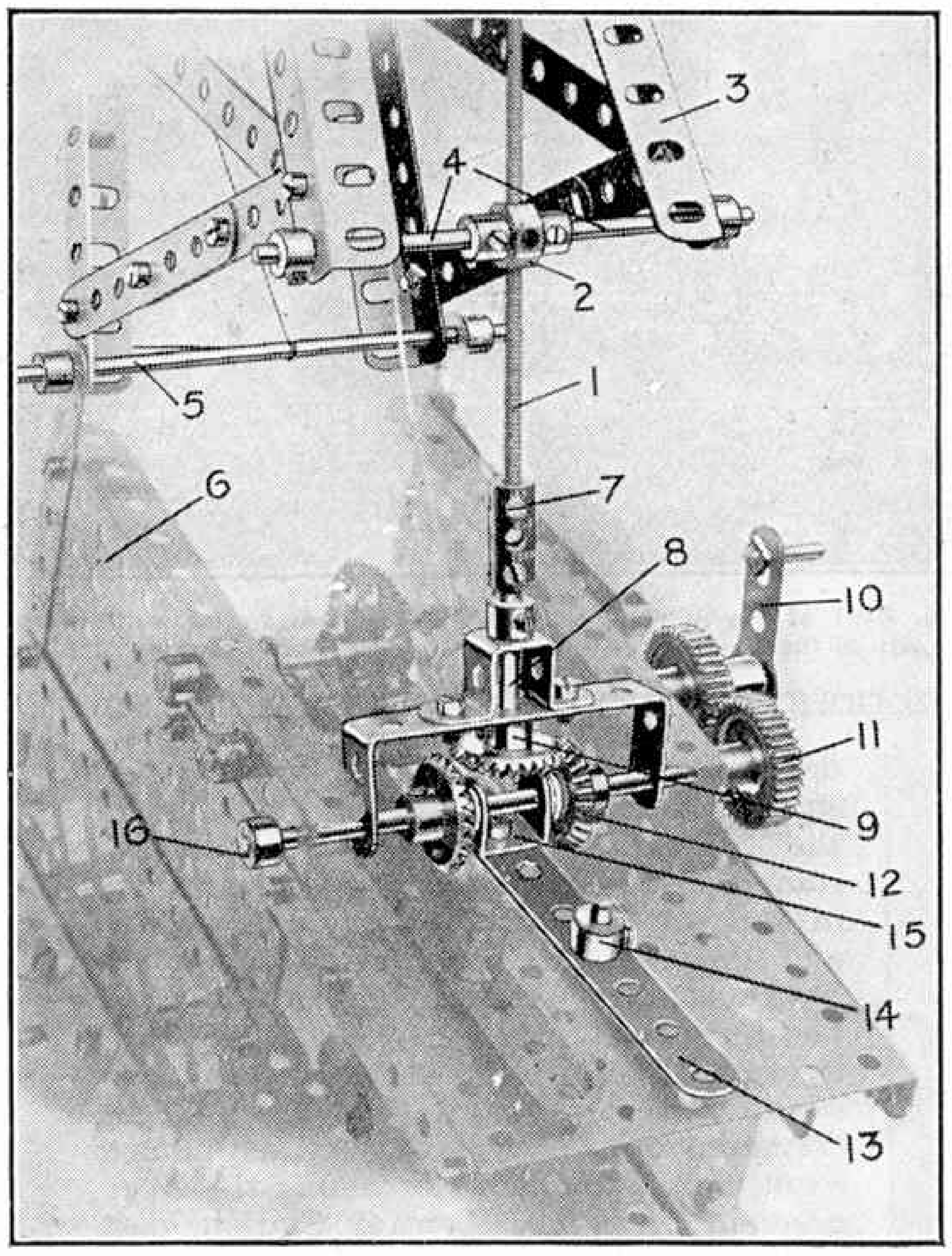
S.M. 131—Screw-Operated Jib

The first example shows the Threaded Rod used to raise or lower the jib of a crane (S.M. 131).

The Threaded Rod 1 engages the threaded borings of an Octagonal Coupling 2, which is carried pivotally from the jib 3 on short Rods 4. The jib, in turn, is pivoted at 5 to the base 6.

The Rod 1 is secured in a Threaded Coupling 7 bolted to a short Rod 8; and the Bevel Wheel 9 on the latter is rotated from the operating handle 10 through 1" Gear Wheels 11 and bevel reversing gear 12 (see S.M. 66). The reverse is effected on operation of a lever 13 pivoted at 14 and bolted to a Double Bracket 15, which is carried on the shaft 16 and spaced by Washers between the two Bevel Wheels.

On rotation of the Rod 1, the Coupling 2 is forced slowly up or down, carrying the jib 3 with it. The jib is caused to rise and fall according to the direction of rotation of the handle 10.



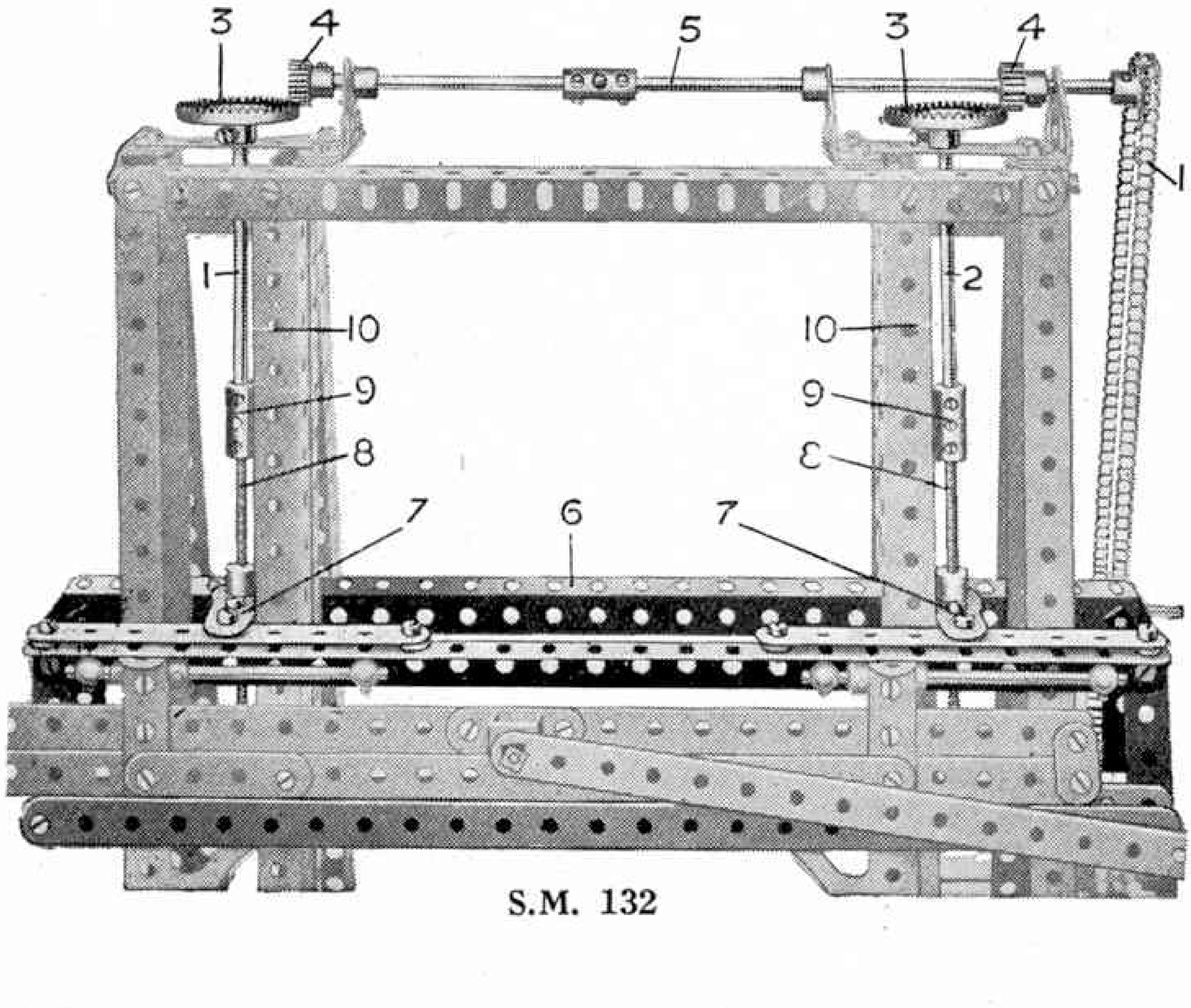
S.M. 131

S.M. 132—Traversing Mechanism

This detail shows a section of the Meccano Log Saw (Model No. 624). In this model Threaded Rods have been employed to adjust the position of the saw, in order that the logs may be cut in sections of any desired thickness.

A vertically adjustable frame 6, which carries the saw, slides on the upright members 10, and is operated from the Threaded Rods 8. These engage with the Threaded Cranks 7 bolted to the frame, and are connected at their upper ends to Axle Rods 1 and 2 by Couplings 9. Rods 1 and 2 are rotated simultaneously from the horizontal shaft 5 by means of 1½" Contrate Wheels 3 and ½" Pinions 4; and the frame 6 is raised or lowered according to the direction of rotation of the vertical Threaded Rods.

The shaft 5 is connected by Sprocket Chain 11 to a hand-wheel conveniently situated in the base of the model.



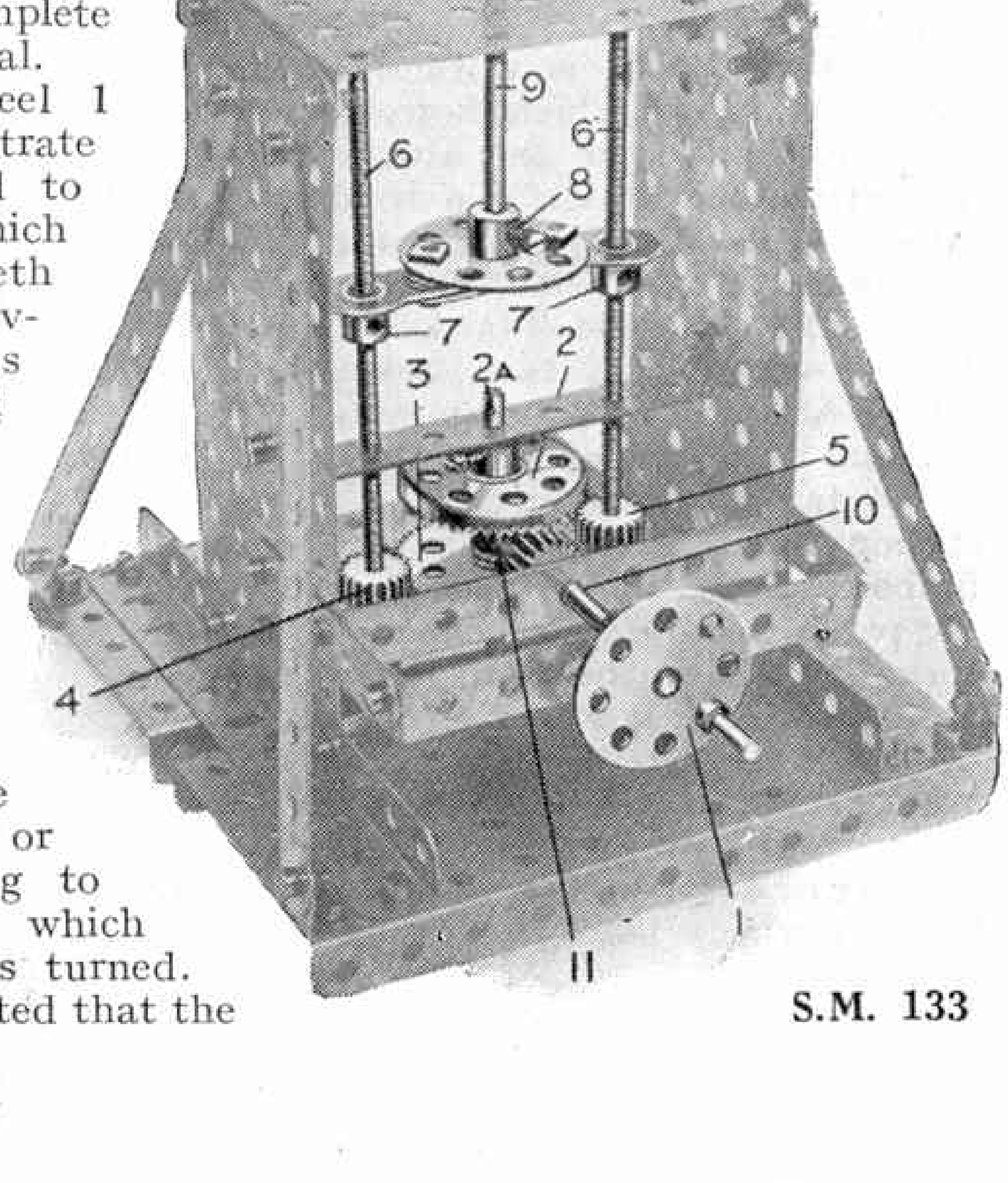
S.M. 132

S.M. 133—Crane Driven by Screw Mechanism

S.M. 133 shows a portion of the Meccano Hydraulic Crane. The Rod 9 is forced up or down on rotation of the Threaded Rods 6, and its movement employed to draw in or pay out the hoisting cord. It should be remembered, that in actual practice, however, this result is obtained by hydraulic power instead of screw gear. For an explanation of the actual hoisting mechanism we would refer readers to Model No. 724 in the complete Instruction Manual.

The hand-wheel 1 rotates a Contrate Wheel 2 secured to a shaft 2A, which carries a 57-teeth Gear Wheel 3 driving the ½" Pinions 4 and 5 secured to the vertical Threaded Rods 6. The latter engage the bosses of two Threaded Cranks 7 bolted to a Bush Wheel 8. The Rod 9 is raised or lowered according to the direction in which the hand-wheel is turned.

It should be noted that the



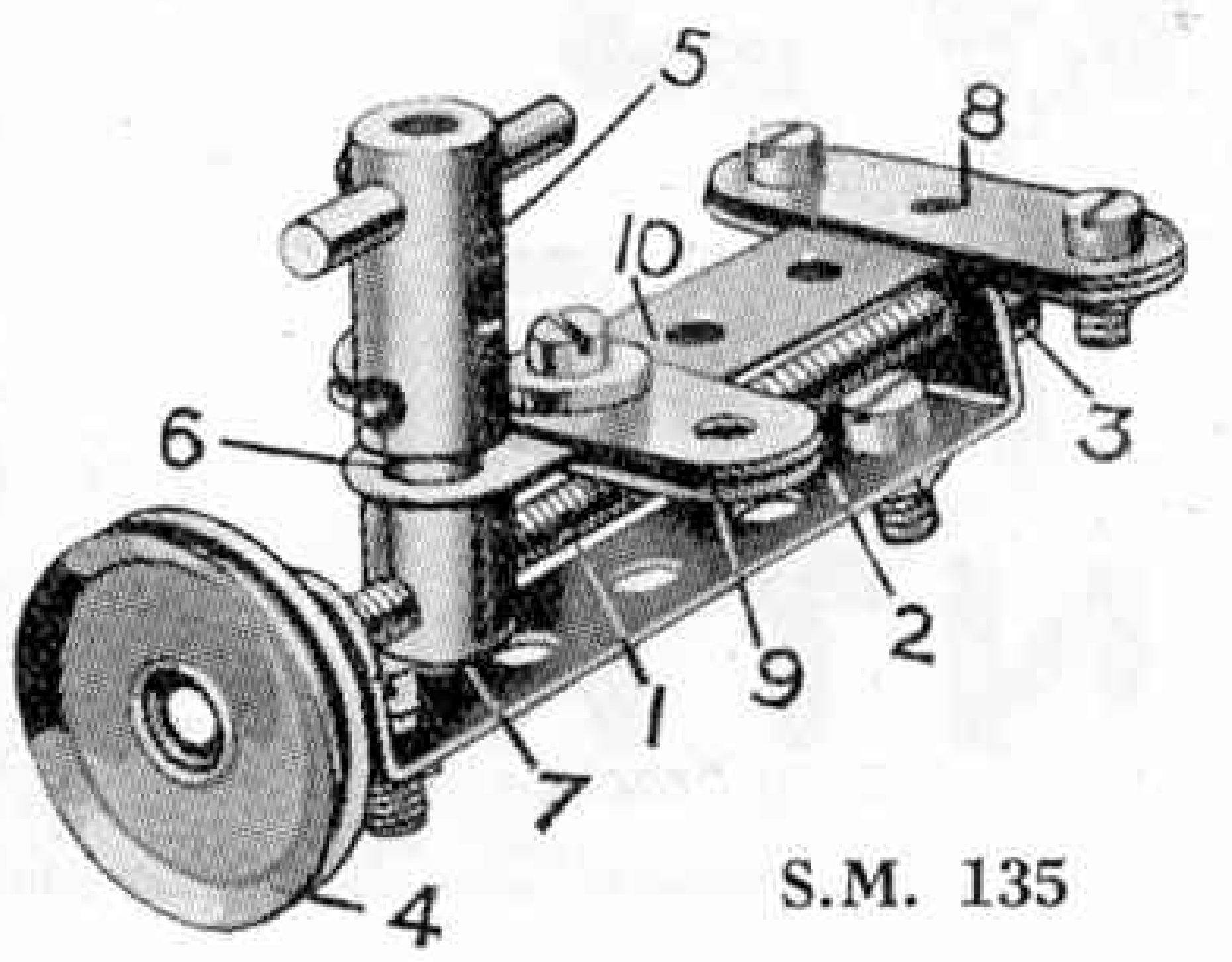
S.M. 133

Rod 10 is journalled in the end of a Coupling 11 which is loosely mounted and spaced with Washers on the Rod 2A.

S.M. 134—Screw-Operated Jib-Raising Gear

This detail illustrates a method by which Screw Gear may be employed in elevating the jib of a heavy crane, or similar work, and incidentally forms a very fine model of the type of gear used in the majority of the world's largest cranes.

The drive is led by way of the 1½″ Contrate Wheel 1 and 1″ Gear Wheel 2 secured to the short Rod 3, to further 1″ Gear Wheels 4 carried on the vertical Threaded Rods 5. The latter engage the threaded borings of two Couplings 6, and as they rotate these Couplings are forced slowly up or down. The links 7, pivotally attached at their lower ends to a Rod secured between the Couplings 6 and at their upper ends to a Rod 8, transmit this movement to levers 9 which in turn are pivotally attached to the jib of the crane. The jib is therefore raised or lowered in consequence of the movement of the Couplings 6.



S.M. 135

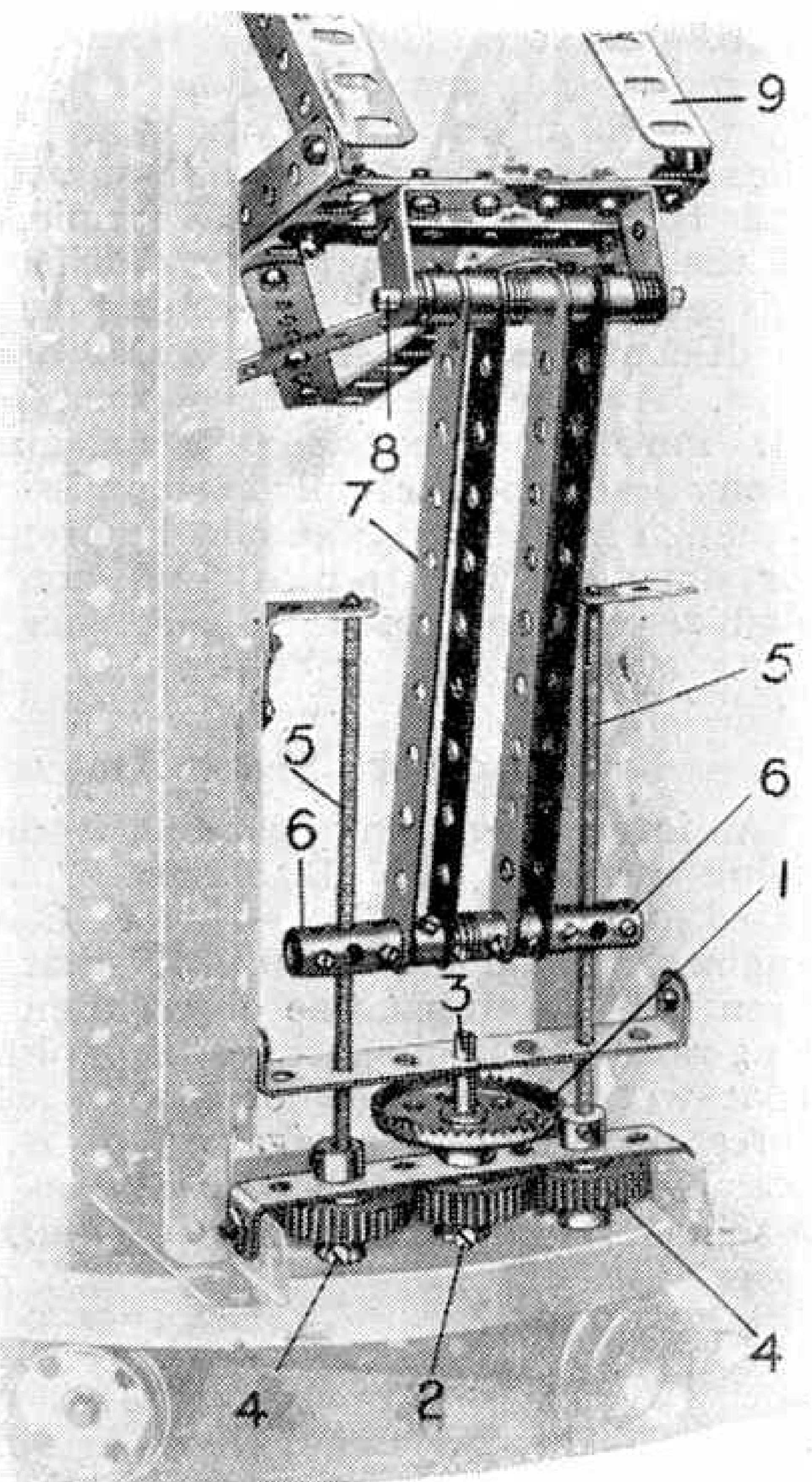
S.M. 135—Lathe Tool Adjusting Device

The Threaded Rod 1, journalled in a Double Angle Strip 2 and held in place by a Collar 3, is rotated by the hand-wheel 4. The tool post 5 is secured to a Threaded Pin 6, which is screwed into a Threaded Boss 7 engaging the Rod 1. Consequently rotation of the hand-wheel causes the tool post to travel to and fro. Two 2½″ Strips on the lathe saddle are bolted between the 1½″ Strips 8 and form guides on which further 1½″ Strips 9 are allowed to slide. The 2½″ Strip 10 secured to the tool post slides between the 1½″ Strips 8.

S.M. 136—Adjusting and Locking Devices

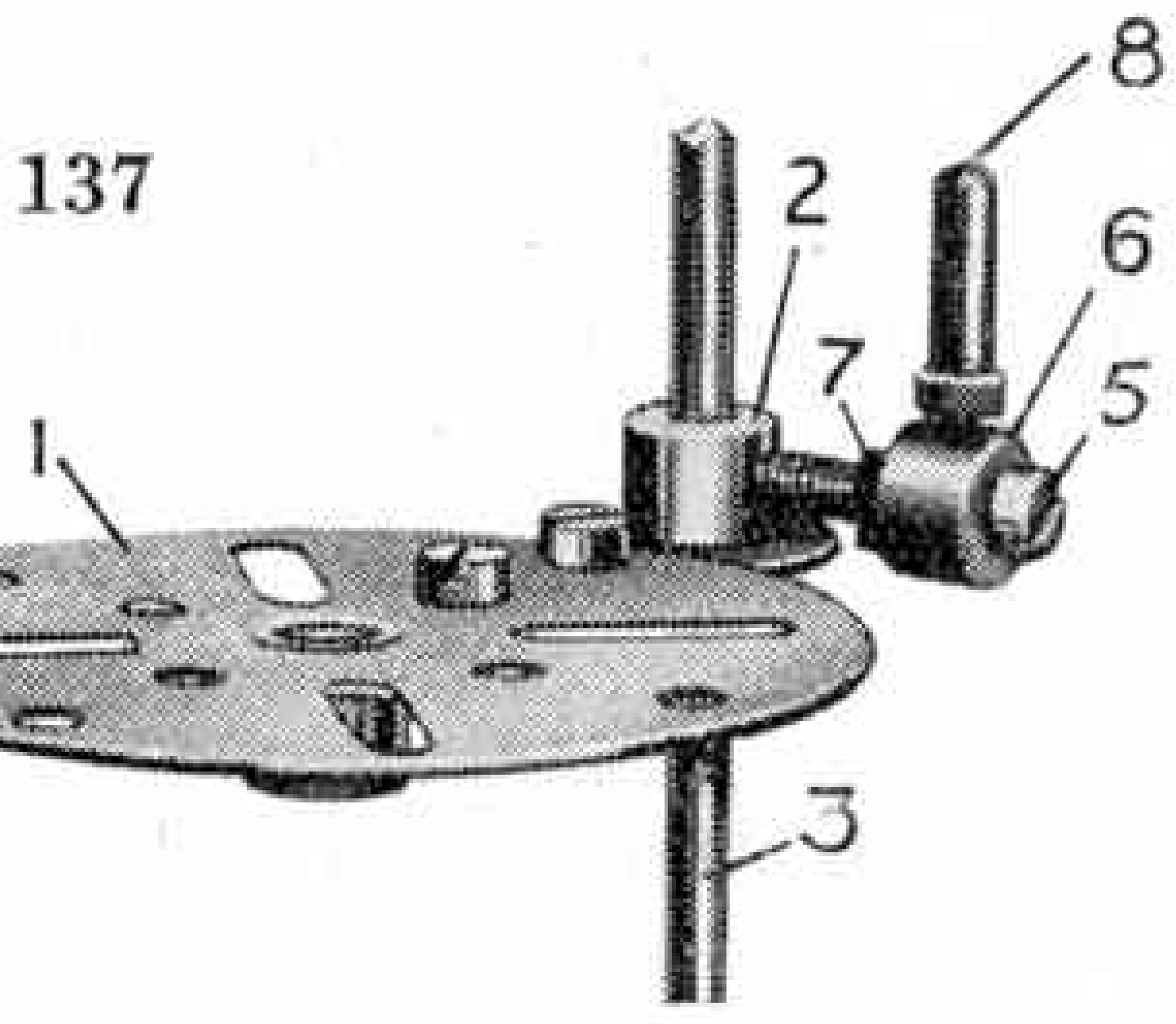
S.M. 136 shows a screw adjustment fitted to the tail-stock of a lathe. The Threaded Rod 1 engages the boss of a Threaded Crank 2, bolted to the tail-stock 3 which slides between Angle Girders 4. The tail-stock is guided by means of a Double Angle Strip, bolted to its underside, engaging the Rod 5. The Threaded Rod 1 is secured by a Coupling 6 to the Rod 7, and is rotated by a hand-wheel 8.

The tail-stock is locked in position on turning the Threaded Boss 9, which engages the shank of a bolt passed through a 1½″ Strip placed transversely beneath the Girders 4. As the Threaded Boss turns, the bolt presses against this 1½″ Strip and causes it to grip the Girders 4, so holding the tail-stock rigidly in position.



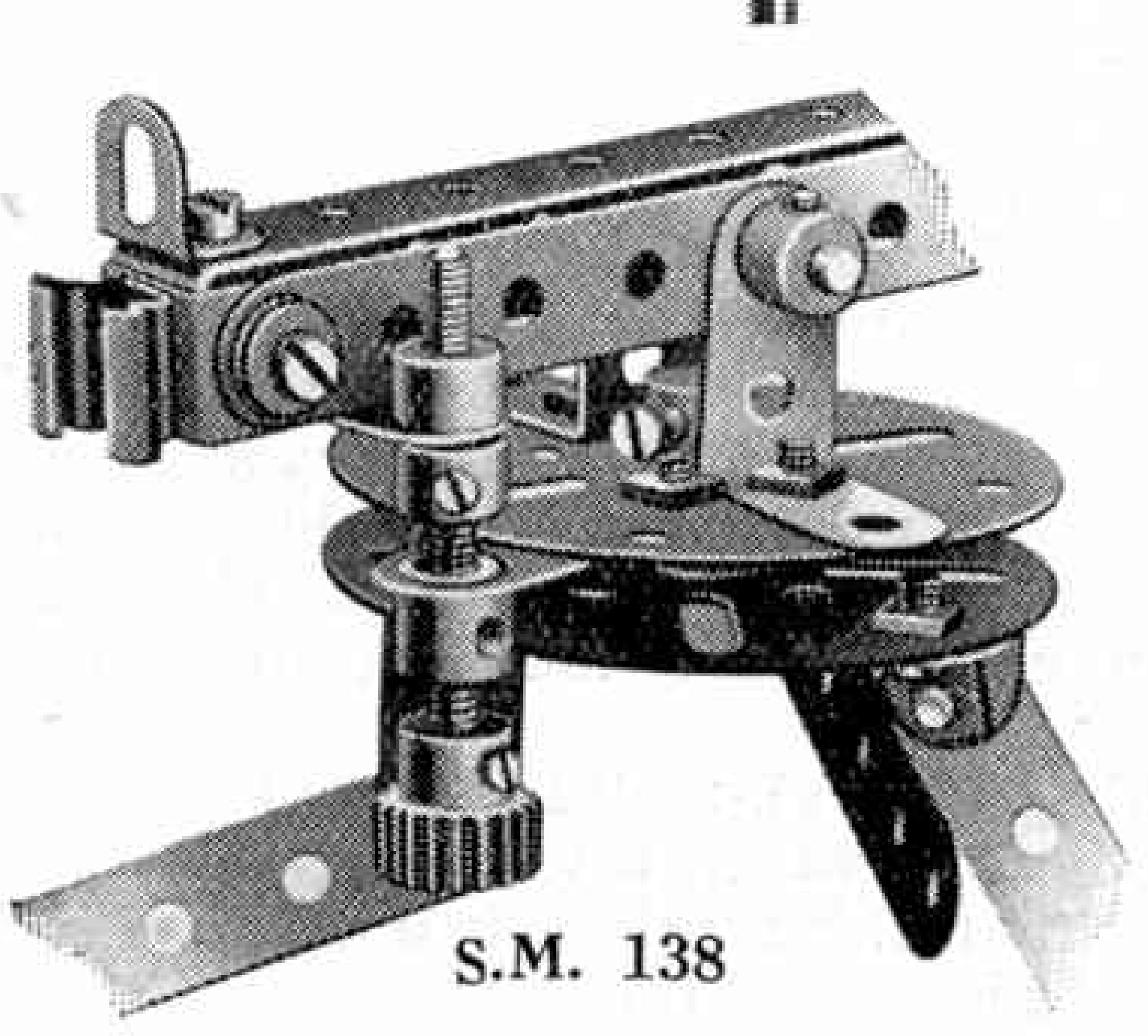
S.M. 134

S.M. 137

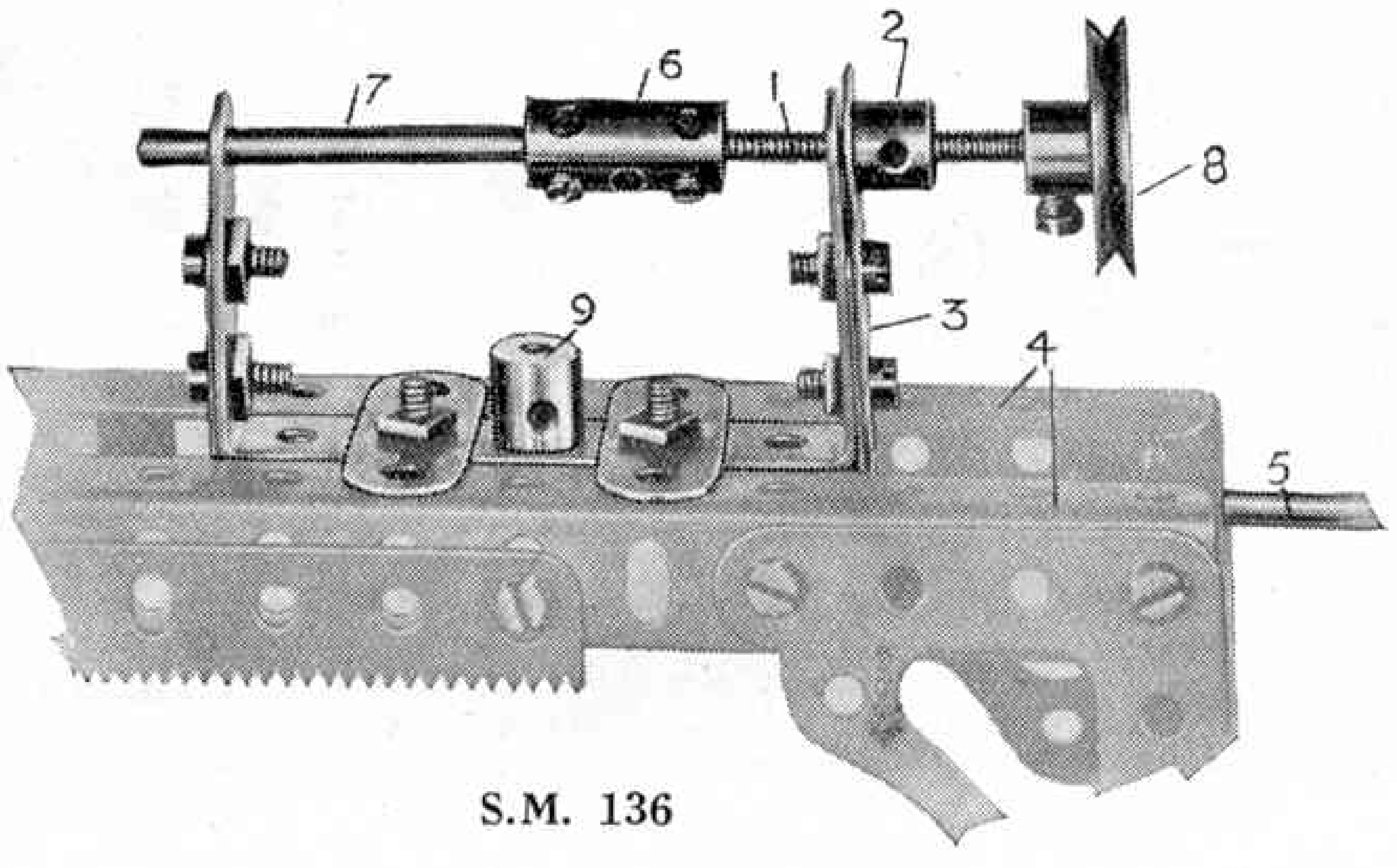


S.M. 137—Locking Device

This illustrates a method by which the table of a drilling machine, or similar apparatus, may be quickly and rigidly locked in any position. The table 1 is bolted to a Crank 2 sliding on a vertical shaft 3. A ¾″ bolt 5 is inserted in the boss of the Crank, and carries a Collar 6 which is held in place on the bolt by a nut 7. The table is locked in the desired position by twisting the bolt 5 until it nips the shaft 3; a suitable handle is provided by a Threaded Pin 8 inserted in the Collar 6.



S.M. 138



S.M. 136

S.M. 138—Screw Adjustment

The Threaded Rod shown in this illustration is employed to adjust the elevation of a machine gun. The rod, engaging a Threaded Crank bolted to the swivelling base, passes through a Flat Bracket on the gun, and is held in place by two Collars. The adjustment is effected by rotating the ½″ Pinion shown, when the Threaded Rod is caused to move up or down in the Crank.

S.M. 139—Screw Adjustment

Here the Threaded Rod is employed as a device for adjusting the table of a drilling or boring machine, etc. The table 1 is bolted to a Threaded Crank 2, the boss of which engages the vertical Threaded Rod 3. The latter carries a Pinion 5, which gears with the Worm Wheel 4 on the shaft of the hand-wheel 6. 2½″ Angle Girders 8 bolted to the table and connected by a Double Bracket 7 slide upon the vertical Girders 9, and form guides to hold the table in position.

The table is raised or lowered according to the direction of rotation of the hand-wheel.

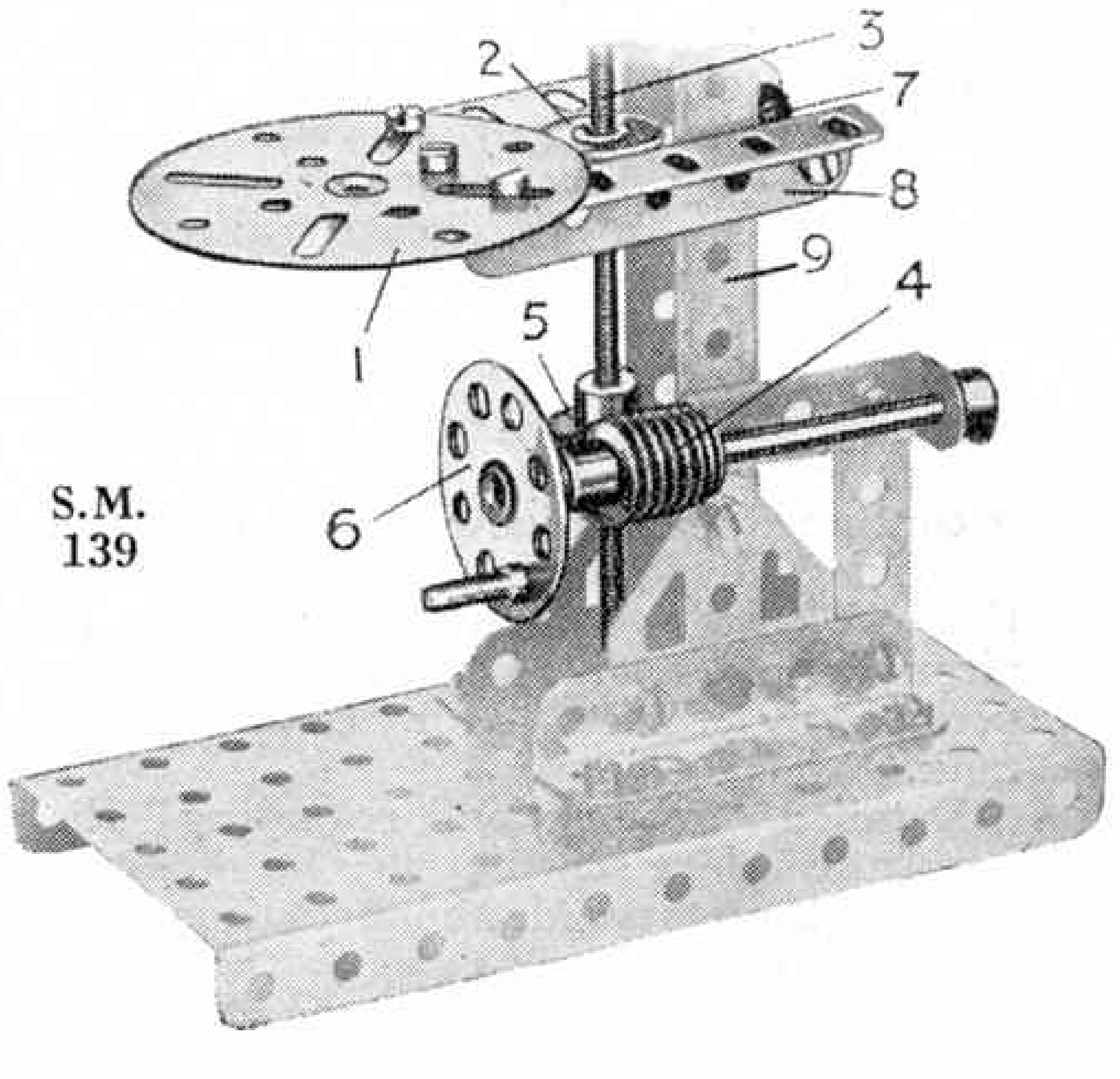
Note.—Where a Threaded Rod is required to rotate in bearings, it should be first connected by Couplings to ordinary Axle Rods, if possible, so that the latter may be journalled in the bearings instead of the Threaded Rod; it will be found that this results in better and smoother working, and prevents possible damage to the threads. Special Threaded Couplings (Part No. 63c), in which the longitudinal bore is cut with a thread through one half of its length, are provided to make the necessary connections.

Further examples of Screw Mechanism are included in Section VI. (S.M. 85 and 86).

Principle of the Screw

It may be pointed out that the screw, used as a mechanical power, is an adaptation of the principle of the Inclined Plane, and in order to appreciate the advantages obtained from its use we recommend readers to study the Meccano model of this principle included in the "Standard Mechanisms" Manual. The spiral thread in the screw corresponds with the slope in the model up which the load must be raised.

Worm gearing is another form in which the screw is largely used in engineering.



S.M. 139

Next Month:
Overhead Trolleys, etc.

TENNIS IN THE AIR 3000' ABOVE LOS ANGELES.
4

AIR NEWS OF THE MONTH

Airship Developments

During a lecture given recently in London some very interesting points on the technical aspects of the commercial airship were dealt with. The lecturer, Mr. B. N. Wallis, stated that the three important factors to be considered were safety, efficiency and reliability. Many of those who were unfamiliar with the past history and development of the airship were of opinion that the airship could never be a completely airworthy vessel, but to those who had studied the many intricate problems connected with the evolution of the airship, there appeared no special weakness or reason why this type of aircraft could not be brought to compare, in its essentials, with the trans-Atlantic steamship of the present day.

The lecturer made special reference to the ex-German dirigible "*Bodensee*," a ship approximately the same size as the pre-war commercial Zeppelins, but possessing twice the engine power and built to carry twice the load at a speed of 75 miles an hour. In the autumn of 1919 the "*Bodensee*" made 103 flights over the Friedrichshafen-Berlin air route. During a period of 98 days she carried 2,380 passengers and nearly 18,000 lb. of mail and general freight. She flew in all 32,300 miles at an average speed of 62 miles per hour.

Referring to the commercial airship now being built for the Government, Mr. Wallis stated that it was quite capable of covering all the proposed intermediate stages on the three commercial airship routes that had been investigated which are as follows:—(1) London to Karachi. (2) London to New Zealand via Baghdad, Colombo, Melbourne and Sydney. (3) London to South Africa via Capetown.

* * * *

R.A.F. Vacancies

The Air Ministry announce that 60 vacancies exist in the Royal Air Force for well-educated boys, between the ages of 15½ and 17, to enter as apprentice clerks. Approximately 40 of the posts will be filled by open competition and the remaining 20 by direct entry of boys who have obtained an approved school certificate. Boys entered under this scheme undergo a two years' course of training in clerical duties, typewriting, shorthand, book-keeping and practical office routine, during which time their general education is continued under qualified schoolmasters. An opportunity will be given to all apprentice clerks to volunteer for training as airman pilots, from whose ranks a few are periodically selected for commissioned rank.

Detailed information regarding the apprentice clerk scheme may be obtained from the Secretary, Air Ministry, Kingsway, London, W.C.2.

The Airship Club

With a view to reviving interest in the smaller types of airship, a club is being formed under the name of "The Airship Club." In view of this fact it is interesting to recall that small airships flew over 2¼ million miles during the war, being engaged principally on anti-submarine and convoy duty. At the termination of the war, the Air Ministry disbanded this section of the Air Forces and decided to discontinue the use of aircraft of this type. At the present time the Royal Air Force does not possess an airship of any description actually in commission—although R33 and R34 could be prepared for duty at short notice—and not one airship pilot has been trained since the war.

* * * *

New Blackburn Flying Boat

An interesting flying boat that is undergoing tests is the Blackburn "*Iris*," fitted with three Rolls-Royce Condor engines, developing 2,100 h.p., that has been built for submarine observation and long-range reconnaissance work. This new boat will carry a crew of ten, including three pilots and a navigator. It is not possible to give further details as the machine is still upon the Air Ministry's secret list.

* * * *

Aeroplane Production

Mr. Fokker, the famous Dutch aeroplane constructor, speaking recently on the subject of aeroplane production, stated that France has the greatest capacity at present, and is capable of producing more than 3,000 aeroplanes yearly. There is a question as to whether the United States or Britain comes second in ability to produce aeroplanes, but with the conditions existing and with the interest being shown in aviation, America would soon be second only to France and ultimately would outstrip her. Development of pilotage in Germany, said Mr. Fokker, is being carried to a high degree of efficiency, the civil aviation schools being without equal elsewhere.

* * * *

To Japan in Five Days

A Japanese expert who has spent some months in Europe studying commercial aviation has for his ultimate aim the establishment of a new air line between Tokio, Shanghai, Tsingtao, Pekin, and Kharbin (Manchuria) for mails and passengers.

This service will link up with the Russian air lines, and it will then be possible to fly between London and Tokio, via Amsterdam and Siberia, in five days. The railway now takes seventeen days.

Spraying Potatoes from the Air

The sight of an aeroplane throwing huge quantities of powder on a 45-acre field of potatoes to protect them from disease, has excited enormous interest among South Lincolnshire agriculturists.

Mr. George Caudwell, of Weston, near Spalding, one of the largest growers of potatoes in the British Isles, chartered a private aeroplane to experiment on a field of "Majestic" potatoes. The powder was contained in two pipes in either side of the fuselage and the machine, working first down and then across the field, flew so low that at times the wheels appeared to nearly touch the tops of the potatoes. An operation which would take two days in the ordinary way was completed in twenty-five minutes.

* * * *

The Desert Air Route

Preparations for the inauguration of the Empire Air Route, linking up England with India via Cairo, Baghdad and Karachi, on 1st January of next year, are proceeding apace, and the first of the giant de Havilland air liners to be employed on the route is undergoing tests prior to being handed over to Imperial Airways.

An interesting feature of the new route is the provision of rest houses for the use of passengers. Instead of flying night and day across the desert, a halt will be made at one of these "hotels" on the evening of each of the three days required to make the crossing.

This, as far as we are able to trace, is the first instance of such accommodation being provided solely for the use of air passengers, although a scheme on similar lines, but rather more ambitious, has been suggested in connection with the proposed trans-Atlantic air route. This idea is to construct large islands of steel, floated on pontoons, and anchor them at various points across the Atlantic. Each of the islands would be approximately 100 acres in extent and would provide first-class hotel accommodation and all other conveniences necessary in air travel over long distances.

* * * *

All-Metal Fighting Machine

A new all-metal fighting machine designed for rapid mass production has recently passed the Air Ministry's official tests. The machine is capable of an extremely high speed and carries two machine guns, each of which will be operated by the pilot.

Unlike earlier all-metal fighting machines, the designs of which invariably have been complicated, this machine can be standardised and turned out quickly by an ordinary engineering works.

Farming by Aeroplane

Among the many interesting uses of aeroplanes for other than purely transport work, we mentioned in these notes some months ago that of spraying insecticides over infected crops.

During the 1925 cotton-growing season over 50,000 acres of growing cotton were sprayed in the fight against the boll weevil, an insect that is the cause of vast damage each year to the cotton crops. So effective was the result that a special fleet of aeroplanes has been built to carry on the work. These machines, flying at a speed of approximately 70 miles per hour between 10 and 20 feet above the ground, will each be able to spray from 600 to 1,000 acres per hour. The old-fashioned type of spraying machine, worked from the ground, covered only 30 acres in a day.

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Artificial Lungs

An ordinary milk bottle, an electric light bulb and a rubber mask are the principal parts of an apparatus recently invented in France that should prove of considerable aid to airmen working at big altitudes. The average pilot can work comfortably at altitudes up to 8,000 ft., but above that the small proportion of oxygen in the air imposes a considerable strain upon the lungs.

To enable airmen to overcome the strain the milk bottle is filled with liquid oxygen. This is vaporised by the heat of the electric bulb, which in turn is controlled by a rheostat of such sensitivity that it will respond to every change of altitude. As the machine rises, an increasing supply of oxygen passes from the milk bottle to the pilot through a rubber tube fitted into a mask covering the mouth and nose, and as the machine descends, the amount of oxygen supplied automatically decreases.

The apparatus worn by Captain Barnard, the pilot of the Bristol Badminton machine in the recent King's Cup race, is of interest in that its purpose is the same. The speed of the machine is such that considerable suction and a consequent partial vacuum is set up in the pilot's cockpit, and to ensure a steady supply of cool air a special breathing mask had to be provided. This apparatus consists of a number of tubes leading from the front of the engine to a funnel-like attachment, slung around the pilot's neck in such a manner that he retains perfect freedom of action while at the same time a steady stream of air is forced up in front of his face and nose. The flow of air can be regulated by the pilot. This apparatus is the first of its kind to be fitted to a racing machine.

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A new record for non-stop aerial flights has been set up by the French airmen, Lieut. Challe and Capt. Weiser, who flew from Paris to Bunder Abbas, on the Persian Gulf, 3,250 miles, without a stop.

Tuning-up a "Moth"

Photo] [*E. Wilson*

The nose of the D.H. " Moth " used by the Lancashire Aero. Club at Woodford Aerodrome, showing the simple design of the modern light aeroplane, which is used by many light aeroplane clubs

Metal versus Wood for Airscrews

Some interesting tests of metal airscrews, as compared with those made of wood, were recently carried out by the de Havilland Aircraft Company with a Fairey-Reed airscrew fitted to a standard D.H.9 machine. The results were very strongly in favour of the former. A machine fitted with the wooden propeller took 61 seconds to climb from 1,000 to 1,500 ft., while the same machine fitted with a metal propeller, and under identical conditions of engine performance and weather conditions, took only 54 seconds. Still climbing, the performances at 3,000, 5,000, 7,500 and 10,000 feet were as follows, the time for the wooden propeller being given first in each case :—3 min. 53 sec. and 3 min. 29 sec., 8 min. 3 sec. and 6 min. 37 sec., 15 min. 6 sec. and 11 min. 39 sec., 24 min. 16 sec. and 19 min. 12 sec.

The weight of the machine fully loaded was 3,410 lb. and it was found that when fitted with a metal screw it could climb to 18,300 ft., that is 2,200 ft. above its performance when fitted with a wooden propeller.

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Belgium to Africa

A new air route linking up Belgium and France with Africa is under consideration. The proposal is to convey passengers and goods, and to call at Marseilles, Algiers, Timbuctoo, Totono and Brazzaville.

Tribute to a British Engine

A remarkable tribute to the efficiency of the Bristol Jupiter engine was paid recently in the French Chamber of Deputies by the Minister for War, who was called upon to defend the French Government's action in ordering foreign engines for installation in the machines of the French Air Services.

After criticising the attitude of French manufacturers who persisted in turning out water-cooled engines, despite proofs of the overwhelming superiority of the air-cooled engines for fighting machines, the Minister stated that the only machines capable of carrying out efficient bombing raids against the Riff positions were the Goliaths, fitted with Bristol Jupiter engines.

In addition to its extensive adoption in France, this famous British engine is being used very largely by aircraft manufacturers in Germany, Italy, and Czecho-Slovakia.

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Flying at 2½d. per Mile

An interesting test of the flying costs of a D.H. Moth was recently carried out by Sir John Rhodes, a member of the London Flying Club, who spent a week-end in the air, covering a total of 792 miles. The average speed throughout the trip was 52 miles per hour and the actual flying time, spread over four days, was 15½ hours. The petrol consumption was just under four gallons per flying hour and the average cost per mile was 2.48d.

Some interesting comments on the future of light aeroplanes and private ownership were made by Sir John, who visited several towns in the course of his flight. The fact that the cost of motor cars to and from the aerodromes to the towns visited was far greater than the cost of flying to the aerodromes, revealed the necessity for landing places in spots adjacent to the centres of large towns. Without the provision of such aerodromes, light aeroplane flying can never secure its full natural development. Sir John expressed the opinion that the light aeroplane is a safer means of transport than the motor car, and discounted the danger of engine failure, the principal source of trouble to the inexperienced pilot, as modern engines are very reliable.

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Dutch Aerial Subsidy

The Netherland Aerial Navigation Company (the K.L.M.) have applied to the Dutch Government for a subsidy of approximately £350,000 to enable them to continue operations, as the company's present agreement expires at the end of this year. The application covers a period from 1927 to 1934. One of the principal ambitions of the company is to establish a regular service between the Dutch East Indies and Holland.

Oil v. Steam—*(continued from page 603)*

Sweden, and the decorations and furnishings of the principal first-class and second-class public rooms are designed after originals within the castle. In addition, reproductions of the numerous portraits adorning the walls of the castle have been placed in the second-class lounge, while a very fine oil painting of the castle itself is to be seen in the second-class dining saloon, which accommodates 242 diners. The second-class vestibule is designed on the lines of the entrance courtyard to the castle.

Passenger Accommodation

Comfortable and thoroughly up-to-date accommodation is provided for 91 first-class, 355 second-class and 1,006 third-class passengers, a total of 1,452. Lounges, bookstalls, reading rooms, etc., laid out on liberal lines, are provided for all classes on the ship. On the shelter deck is an excellent gymnasium and down in the forehold of the vessel is a fine swimming bath, 30 ft. in length and 15 ft. in width, with all the necessary dressing rooms and other appurtenances. Electric and vapour baths are also obtainable.

The vessel has eight decks in all. The highest or boat deck contains in its deck house a perfectly equipped gyro-compass room, adjoining which is the wireless telegraph office. At each side of the funnel uptake are rooms containing the silencers for the main engines. The steering gear, which is housed on the upper deck, is of the hydro-electric type. The double-ended tiller mounted on the rudder stock is actuated by four hydraulic rams and the steering may be controlled either from the navigation bridge on the boat deck or from the wheelhouse on the promenade deck. An electrically driven bilge pump is provided to draw water from the ship's bilges or from the sea and to discharge overboard or into the fire and wash-deck services.

Watertight Doors

The provision of watertight doors below the bulkhead deck is of vital importance in the safeguarding of a liner. The "*Gripsholm*" is thoroughly equipped in this direction, the watertight doors being operated by hydraulic power and controlled from the bridge. In the unlikely event of the main power failing, a reserve accumulator providing power sufficient to close all watertight doors twice can be brought into use immediately. There is a cellular double bottom extending the entire length of the ship, the various compartments in which are utilised to carry oil fuel for the engines, and water.

The ship is electrically lighted throughout and has five electrically-operated lifts situated at various points.

The Main Engines

The "*Gripsholm*" is equipped with two four-cycle double-acting six cylinder Burmeister and Wain marine Diesel engines. These engines give a total of 16,300 indicated h.p. (13,500 brake h.p.), or 6,750 brake h.p. each, when running at a speed of 125 revolutions per minute under normal conditions at sea. These engines work on what is known as the clear Diesel principle. Inlet air is compressed to a pressure of 32 atmospheres, thus attaining a temperature sufficiently high to ignite the atomised oil without the aid of red-hot bodies or other means of ignition.

The propelling engines do not drive their own compressors and therefore three separate Diesel-driven three-stage compressors are installed in an auxiliary engine room. Each of these compressors is capable of supplying the necessary compressed air for one main engine and consequently only two are in operation when the vessel is under way, the third serving as a stand-by. The compressors also supply the necessary compressed air for manœuvring the ship. They are each coupled to a 700 b.h.p. four cylinder Burmeister and Wain standard Diesel engine running at 170 r.p.m.

In addition to the engines driving the compressors there are three 500 b.h.p. single-acting three cylinder Diesel engines running at 200 r.p.m., each coupled direct to a 220-volt dynamo having a capacity of 330 k.w. A total of 990 k.w. is thus available for supplying current for operating the auxiliary machinery, and for lighting and other purposes.

Total of 17,100 h.p.

The total power of the auxiliary engines installed in the separate engine room is 3,600 b.h.p. and the total power of both main and auxiliary engines amounts to 17,100 b.h.p.

It will be seen that the machinery is arranged in two separate engine rooms, the main engines with all necessary auxiliaries are located in the after engine room, 48 ft. in length, while the remainder of the machinery is housed in the forward engine room which has a length of 62 ft.

The "*Gripsholm*" was placed in service on 21st November 1925, and she has given thorough satisfaction in every respect. Some idea of her efficiency may be gained from the fact that on a recent homeward-bound trip she averaged a speed of 16.9 knots for the total voyage and for 24 hours maintained a maximum speed of 17.3 knots. Her average daily fuel consumption was 46.9 tons.

Famous Engineers—*(continued from page 606)*

resume operations at Bedford Level was a failure, but seven years later permission was obtained. Vermuyden was immediately re-engaged and work enthusiastically started, but the old problem of finding money soon slowed down progress.

Finding themselves unable to continue paying the wages of the skilled workpeople, the company decided to employ forced labour, and in 1650 secured a grant of 106 Scottish prisoners from among those taken at the battle of Dunbar. When the strife with Scotland ceased the Scotsmen were freed and operations at Bedford Level once more looked like being compulsorily held up. After some difficulty the Scottish labourers were replaced by 500 Dutch prisoners who were part of the heavy capture resulting from Blake's victory over Van Tromp in 1652.

In March 1652, the scheme was declared finished and was duly inspected and passed by a Parliamentary Committee, who sailed along the various waterways that had been cut. The completion of the undertaking was celebrated by a special Thanksgiving Service held in Ely Cathedral.

The closing years of Vermuyden's life are lost in obscurity. Although at one time he must have been a very wealthy man, there appears to be little doubt that at a later period his schemes resulted in great financial loss, forcing him to sell almost all his land. His last days undoubtedly were spent in comparative poverty. The date of his death is uncertain, but it probably took place late in 1665 or early in the following year.

OUR MAIL BAG

In this column the Editor replies to letters from his readers, from whom he is always pleased to hear. He receives hundreds of letters each day, but only those that deal with matters of general interest can be dealt with here.

Correspondents will help the Editor if they will write neatly in ink and on one side of the paper only.

Harold S. Fisher (Stow-on-the-Wold).—

" All the things that others do,
Why with patience should not you ?
Only keep this rule in view :—
Try, Try, Try again ! "

We like your motto, Harold, and we are pleased to learn of your recent journalistic success. Any short stories or poems that you care to submit for consideration will be welcome. We note you once held the idea that Editors are very superior persons and easily offended, and are glad that you now know better !

C. Robinson (Hull).—" I have fastened this year's Magazine covers on my bedroom walls, and by next year I shall have a nice little bedroom ! " You will have a typical Meccano boy's room, with your "*M.M.*" wallpaper and your Hornby track laid out on the floor. You certainly sleep in the correct atmosphere. Yes, we know Hull well—in fact it is our birthplace.

G. Shaw (Quebec, Canada).—We were interested to see your little journal with the lurid title " The Blast." We appreciate the enthusiasm of you and your chums and think it a pity that you are not a member of a Meccano Club. Have you considered the possibilities of forming one ?

Hermann Jacobsen (Johannesburg).—" I think I am one of the happiest boys in the world, as I have everything one could desire—a good home, father and mother, a fine Meccano Set and my own little library." We, too, think you are lucky, Hermann, and are glad to find you realise your good fortune. So many boys take these things for granted and do not appreciate them !

E. Holder (Trinidad).—" I usually lend my '*M.M.'s*' to my Father, who is in Venezuela. This is what he said in a recent letter. " I am returning the Mags. by next mail. I can assure you I am enjoying them. I am not surprised at your enthusiasm." We agree with you that it is gratifying to learn that the "*M.M.*" is " as much a favourite with the grown ups as with us." We have vast numbers of fathers and uncles among our 60,000 readers. We liked your letter and you must write again.

A. P. Mittra (Delhi).—We are glad to know that Delhi Week was so great a success and that the Meccano stand proved very attractive. We note that among interested patrons were Lord and Lady Reading, Mr. Richy, the Superintendent of Education and Dr. Sethna, Health Officer of Delhi, and we note their appreciative remarks with pleasure.

A. Bradley (Middlesborough).—As you say " summer is alright with its Cricket, Tennis, White Flannels and Boating," but we quite understand your preferring Winter for Club nights. We believe that the jolliest evenings are spent in the Club room with a cheerful fire and Meccano everywhere.

F. F. Wildman (Kendal).—" I suggest the institution of a Meccano Night each week at the Liverpool B.B.C. Station. Talks could be given as in the '*M.M.*' and be simultaneously broadcast to all stations." Why not write to the B.B.C. about it, F.F. ? No doubt if a sufficient number of readers asked the B.B.C. for this feature, something would be done.

Mrs. Shakleton Fitton (Whitworth).—We were very interested to learn that three of your uncles were members of the old " Kurious Klub " of Liverpool, and that you possess the original Doomsday book of that Club. We are very contrite on learning that we addressed " Miss " Lucy as " Master " Fitton in replying to her letter, and promise that next time we will remember !

G. L. Rhodes (Auckland).—We are interested to learn that Auckland Grammar School at which you are a pupil, is the largest school in New Zealand. Your mother must have given you quite a treat in buying the parts for a two-valve wireless set and allowing you and your brother to assemble it yourselves. Congratulations upon accomplishing the feat successfully. The word " Meccano " is pronounced MEK-AR-NO, with the accent on the second syllable.

J. M. Russell (Southport).—" The '*M.M.*' is at present as good as really good Magazines can be." We appreciate your tribute, J.M., and we think you are as keen as really keen Meccano boys can be. Thanks for your article, which shall have consideration

A MOTOR THAT WILL TRAVEL ON LAND OR WATER

OUR BUSY INVENTORS

RECENT INTERESTING PATENTS

To Drill Square Holes

This certainly sounds more marvellous than is really the case, for the hole is not actually cut in the same way as with the usual type of drill.

The new drill consists of a box-shaped head having small circular saws on each side. The head is clamped in position by means of two screws on an ordinary brace attached. By turning the brace the saws are made to revolve, thus cutting out a clean hole 3½ in. × 2¼ in.

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To Kill Flies

A patent for killing flies is shortly to be placed on the market. The invention is that of the late Professor Maxwell-Lefroy, who was one of the greatest authorities on scientific insecticides. Shortly before his tragic death he invented a spray for killing flies, which is simple, cheap, and foolproof, and will be on sale shortly at a cost of only a few shillings.

The invention resembles to a certain extent an ordinary bicycle pump and has no other purpose or effect than that for which it was invented. The spray is in a very fine form, so fine that it will not even damp curtains or furniture in the room in which it is used, nor will it harm anything but the flies it is intended to kill. One imagines that this patent will have considerable commercial possibilities.

* * * *

A Chance for Inventors

An invention that is badly needed is a foolproof gear-box for motor-cars. At present changing gear, especially on some cars, is the cause of great annoyance to drivers, many of whom find it impossible to make a clean change down from top to second gear. The result is that there is a grinding of gear-wheels and the car loses speed. When this occurs on a hill it causes the car to lose "way," or impetus, just when it is required most.

Most motor firms to-day are too busily engaged in turning out engines that will give increased road speeds, although most cars are already speedy enough for ordinary needs, and little progress has been made in gear-box design since the early days of motoring. Motor-cars cannot give real efficiency when drivers are not able to change gear with precision, and a fortune awaits the designer of a foolproof gear-box.

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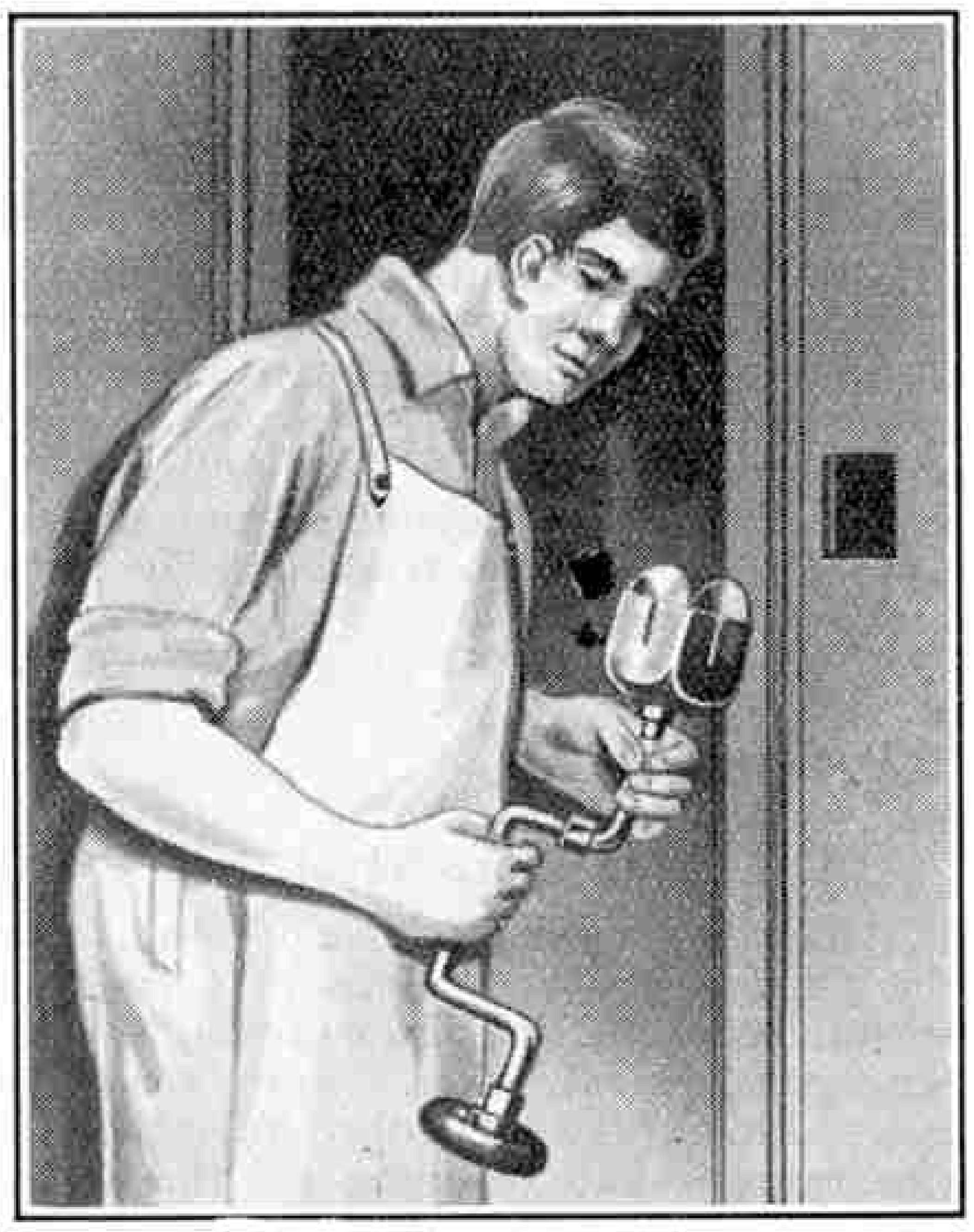
Lighthouse Invention

The German Government are experimenting with a new invention for lighthouses, but the nature of the invention is at present a closely guarded secret. The experiments are being carried out at the island of Borkum.

Women as Inventors

Among the patents taken out by women during 1925 are the following :—(1) A tray on which perambulators may be stood to prevent the water dripping off the wheels on to the floor. (2) A device for mashing potatoes in an easy and convenient way. (3) A continuously-acting candle-making machine. (4) A device for fixing on the inside of gas ovens, capable of being easily and quickly cleaned. (5) Device for automatically cutting off the gas when the flame is accidentally blown out.



Drilling Square Holes

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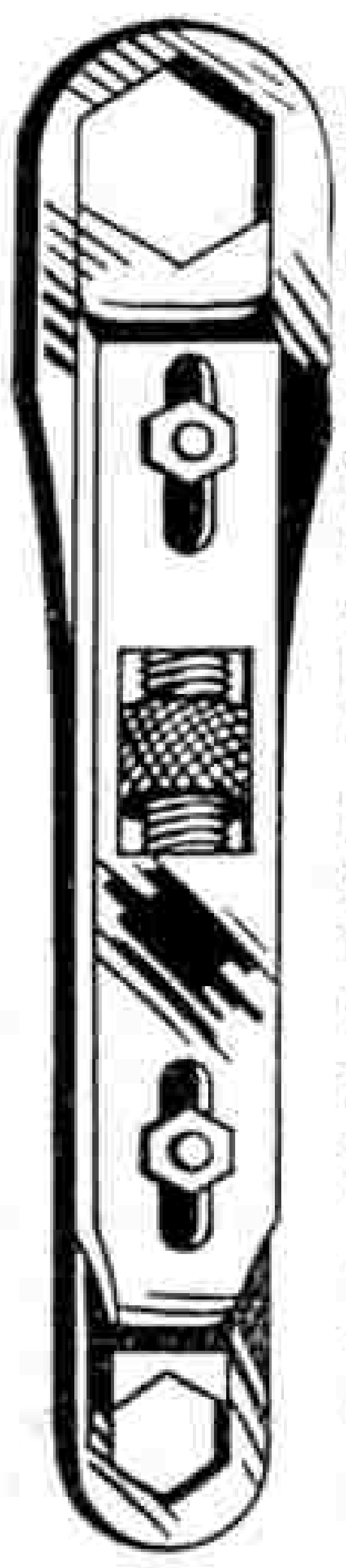
An Adaptable Spanner-Wrench



All our readers are, no doubt, familiar with the adjustable "bull-dog" type of wrench and know how useful it is when nuts of various sizes have to be tackled. Now comes an adjustable wrench of the spanner type in which we feel sure our readers—and especially those who own bicycles—will be interested. This wrench, which has been patented, has a sliding beam that adjusts jaws at both ends of the tool, enabling it to fit many different sizes of nuts. Gripped at the middle, the bar may be moved easily in either direction by turning a thumb-screw. The wrench is made of specially treated steel to resist wear and to prevent nuts from the damage usually caused by pressure from ordinary wrenches.

Loud Speaker Earthquake Alarm

A new instrument for giving warning of earthquakes has been invented by a Japanese professor, Dr. Jun Shida, of Kyoto University. This instrument has been designed to amplify the delicate shocks or tremors that precede the more severe earthquakes and thus to give warning of approach of the latter. An audible warning of slight tremors thus would give people time to leave their homes and offices before the arrival of the destructive shock.

The instrument consists of a pendulum, an electric coil, and an amplifier of the usual wireless type. The pendulum is very delicately balanced so that it responds to the slightest vibration. When a slight earth tremor occurs the pendulum is set in motion relatively to its support, and this motion is arranged to generate electricity in the coil. The currents actuate a sound-producing device and after being amplified the sound is further magnified by a loud speaker. It is hoped ultimately to transmit warnings of earthquake tremors directly by wireless means to different stations.

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Patent Goal-post Net

One would not suppose there could be any close connection between the engineer of one of our largest cities and a patent goal-post net. However, to Mr. J. A. Brodie, until recently engineer for the city of Liverpool, is due the credit for inventing the goal-post net now in almost universal use on football grounds.

About thirty years ago Mr. Brodie witnessed a disturbance on a local football ground, arising out of a dispute as to whether or not a goal had been scored by the home team. In those days it was sometimes difficult for a referee to decide whether the ball had passed through the goal-posts or not. The dispute set Mr. Brodie thinking, and he eventually evolved the idea of the goal-post net and patented his design.

The net was first used in a match between Notts Forest and Bolton Wanderers and later received the approval of the Football Association, who made its use compulsory in all cup-ties. It is interesting to note that Mr. J. A. Brodie recently retired from his work as city engineer, in order to carry out his duties as one of the engineers for the new Tunnel under the Mersey.

* * * *

Safer Searchlights

Improvements in the iris shutters of naval searchlights have recently been made by Ewart & Sons Ltd., of London. The object of the shutter is to have a perfectly light-tight screen, so as to prevent enemy ships torpedoing ships when using their searchlights.

ENGINEERING NEWS OF THE MONTH

Broadcasting for India

A company entitled the Indian Broadcasting Company has been formed to open and maintain wireless broadcasting stations at Bombay and Calcutta respectively. The stations will each be equal in power to the B.B.C.'s London station and, as the work is being put in hand immediately, it is anticipated that they will be open for service before the commencement of the next cold season.

* * * *

Iron v. Brick for Houses

There was recently laid before the Sheffield City Council an extremely interesting report on the comparative costs of cast iron and brick houses. A firm was invited to tender for the erection of 189 houses to be constructed of cast iron, and the tender thus obtained was compared with another submitted for the same contract, the two specifications varying only by the substitution of brickwork for cast iron. It was found that the brick house, with a slightly larger superficial area than the equivalent iron house, was between 12 and 15 per cent. cheaper, while an added factor in favour of brick was that repayment of the Ministry of Health loan would be spread over 60 years in the case of a brick house, but only 40 for the iron house.

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Huge Power Station for Chiswick

An agreement has just been reached whereby the Chiswick District Council will transfer 45 acres of land, situated at Dukes Meadows on the River Thames at Chiswick, to the Home Counties Joint Electricity Authority for the establishment of a huge power station. The cost of erecting the building and equipment is estimated at £2,000,000, and the station probably will be placed in service during the winter of 1928-1929.

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Irish Oil Port

Extensive developments are projected at Foynes, a small port on the River Shannon in Ireland, where two of the leading oil transport and distributing companies, the British Petroleum and the Irish-American Companies, have established discharging depôts for their ocean-going tankers.

A deep water quay, affording a minimum depth of 25 ft. and served by a railway line, is already in existence and consists of a stone pier with a wooden extension. Large vessels are able to come straight alongside, discharge into rail trucks and leave again without the necessity of considering the state of the tide and this, of course, is an important factor in favour of the new port. The present accommodation is sufficient for the existing traffic but a new deep water berth, 200 ft. in length, is under consideration. Plans are to be prepared also for extensive new warehouses and railway sidings. A new wall joining the existing two piers, to serve as a deep water quay and at the same time enclose the area on the landward side, for reclamation purposes, is to be constructed.

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New Lancashire Road to Cost £3,000,000

After many months of negotiation, the Government have given their approval to the scheme for the construction of a new arterial road between Liverpool and Manchester. The road will be 26½ miles in length and about twenty bridges will have to be constructed. The total width between the fences will be 100 ft. The cost is estimated at £3,000,000 and of this the Government will contribute 75 per cent.

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The Singapore Naval Base

Work is progressing very steadily on the preliminary operations in connection with the construction of the much-discussed Singapore Naval Base. More than 800 native labourers are engaged in re-claiming the swamps and draining off the water, and a large gang is spraying oil in the attempt to eliminate the mosquito trouble. Six dredgers are at work in the harbour while pile-driving is being carried out on the water front.

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M.S. "*Accra*"

The motor ship *Accra*, a brief note concerning which appeared in our May issue, passed her trials recently and has been delivered to her new owners, Messrs. Elder-Dempster & Co., of Liverpool. The vessel is intended for the Liverpool–West Africa service and the accommodation is on a lavish scale. Electrically-driven ventilating fans supply fresh air throughout the whole of the ship, while each individual cabin has its own separately-operated fan and heating unit. The *Accra's* propelling machinery consists of two six-cylinder, four-cycle, double-acting Diesel engines, each rated at 3,750 h.p.

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Record in Shaft Sinking

A record in speedy shaft sinking has been set up in South Africa on the Randfontein Estates. A circular ventilation shaft, 23½ ft. in diameter, was sunk a distance of 332 ft. in 31 days. The previous record was 318 ft. sunk on the Crown Mines. An interesting feature of this instance of speedy drilling is that the steel used for the drills was made in Sheffield, by Edgar Allen & Co. Ltd.

South African Engineering Activities

The first steel rails to be made entirely of South African material were rolled at the Vereeniging mill of the Union Steel Corporation of South Africa in July last. This is only one instance of the steady expansion of engineering activities in South Africa, for the same company were erecting a new rod mill and a wire works and galvanising plant, while the Union Mining Machinery Company are about to erect a factory at Vereeniging for the manufacture of steel tubes and cast iron pipes. New factories and extensions to existing plants are being contemplated by practically every industry in the country, while several municipal councils are drawing up schemes for an electric power supply.

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Record-Breaking "Skyscraper"

The 62-floor Woolworth building in New York, at present the highest building in the world, will be dwarfed by comparison with the new Book Tower building, the construction of which has just commenced in Detroit. This huge building will rise 873 ft. above the street level and will have 85 floors, of which four will be below the ground.

The main building will consist of 42 storeys each containing 230,000 sq. ft. of space, and the tower will house the remaining 43 storeys, the lowest of which will have a superficial area of 15,000 sq. ft. The building will be of steel and concrete, faced on its lower floors with marble, granite and light buff brick.

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A hydro-electric plant, the first to be installed in the Federated Malay States, is shortly to be erected on the Parak River and current will be supplied to the many tin mines in that area. The plant will have a maximum generating power of 18,000 kilowatts.

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A concrete oil reservoir capable of holding 4,000,000 barrels of oil has just been completed in California. This reservoir is the largest of its kind yet constructed.

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Australian Floating Dock

An agreement has been signed between the State Government of New South Wales and the Commonwealth Government for the construction of a 15,000-ton floating dock at Newcastle, New South Wales. The total cost of this dock will be £545,000 and of this the Commonwealth Government will provide £135,000, the remainder of the cost being borne by New South Wales.

Dock Extensions at Tilbury

An ambitious scheme, which seeks to set London in the front rank of ocean passenger ports, is being embarked upon by the Port of London Authority at Tilbury. The complete range of docks will be modernised, a new river entrance lock and a new graving dock constructed, and a new passenger landing stage built to replace the present structure. In addition to this programme, the London, Midland and Scottish Railway will enlarge and improve their adjoining station. The total cost of the improvements in hand and projected is £4,000,000, a large portion of which is being met by the Government.

The new entrance lock will join the river some little distance west of the present tidal basin entrance to the docks and will be 1,000 ft. in length and 110 ft. in width, while it will possess a depth of water at high tide of 45½ ft.

The new dry dock is to be 750 ft. in length and 110 ft. in width, and its depth will allow 37½ ft. of water to enter at high tide. The plans of the dock will allow of a later extension to 1,000 ft. in length if necessary, and the dock would then be capable of accommodating the largest present-day vessels.

The landing stage will be 1,140 ft. in length and the depth of water will be sufficient to enable ocean liners to come alongside to discharge and embark passengers—a definite improvement in every respect upon present conditions, which make it necessary to handle all passenger traffic from midstream by tender.

Coupled with the Tilbury extensions are the improvements now being effected at the India Docks and the Millwall Dock, where a new river entrance and several connecting locks are being constructed. The combined effect should be to offer considerable inducements to passengers to travel direct to London, instead of overland from Plymouth, Southampton, Fishguard and Liverpool.

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New Coal Find in Lincolnshire

A syndicate that has been engaged for some time past in boring for coal at Harby, a few miles west of Lincoln, reports that a comparatively rich seam of coal has been struck at a depth of 902 yards. Officials of the Geological Survey have identified the seam as a continuation of the one found at a depth of 850 yards at Retford, 12 miles away and, assuming that the depth is the same throughout, the seam will be workable throughout Lincolnshire.

Barking Electricity Extension

Considerable extensions are to be undertaken at the Barking Electricity Station, London, of which, as our readers will perhaps remember, the first section of 100,000 k.w., was opened by the King.

The main items of the new boiler plant will be ten Babcock and Wilcox boilers, each of 16,500 sq. ft. heating surface, equipped with superheaters of 6,500 sq. ft., and economisers of 6,100 sq. ft. area.

A new feature is that pulverised fuel will be adopted, although mechanical stoking only is now in operation. The pulverised fuel equipment will include 15-ton pulverising mills, each with its own exhauster and cyclone separator.

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240 Telephones Disabled

A leaking water main and a hole about the size of a pin's head, which formed in the lead casing deep in the ground below Trafalgar-square and was caused by vibration set up by the traffic overhead, recently caused one of the largest telephone cables in London to go out of action. The defect rendered temporarily useless the telephones in all the hotels, shops and offices in the Charing Cross district.

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Huge Turbo-Generator

A turbo-generator three times the size (in point of output) of any machine hitherto built, has been ordered for the Hell Gate power station, New York. The generator will have a continuous output of 160,000 kilowatts, which load, distributed over say six or seven generators, would constitute one of our largest power stations.

The reason for using a machine of such immense size is the great value of floor space in and around New York. The set will be of the cross-compound type and will have one high-pressure cylinder running at 1,800 r.p.m. driving a 75,000 kw. generator, and one double-ended low-pressure cylinder driving an 85,000 kw. generator at 1,200 r.p.m. wound for 13,000 volts.

New Concrete Bridge

The longest ferro-concrete arch bridge span in Wales, was recently opened at Cymmer, in the valley of the River Afan. Spanning a deep gorge between two railway stations, one on the Maesteg line and the other on the Swansea-Treherbert main line, the new bridge constitutes an important link in a scheme of highway development formulated by the County Council and the Ministry of Transport. It is 240 ft. in length, with an arch span of 160 ft. and carries a new road at a height of 90 ft. above the river bed. The roadway is 20 ft. in width and is flanked by footpaths supported by the cantilever ends of the transverse deck beams.

* *

Huge Concrete Spans

The rebuilding of Kelvin Hall, Glasgow's famous exhibition hall, which was destroyed by fire last year, is proceeding apace and is attracting unusual attention because of two remarkable features. Concrete roofs are being built and, to enable the work to be carried on, an extraordinarily complex scaffolding has been erected. So thick is the tangle of joists that the structure gives an impression of a tropical jungle.

The roof of the new building is planned in spans 110 ft. in width. These are the widest concrete spans in the world, and they will be covered with slabs each having a surface area of 733 sq. ft., though only four inches in thickness. The total air space of the new hall when completed will be nearly 12,000,000 cu. ft.

* * * *

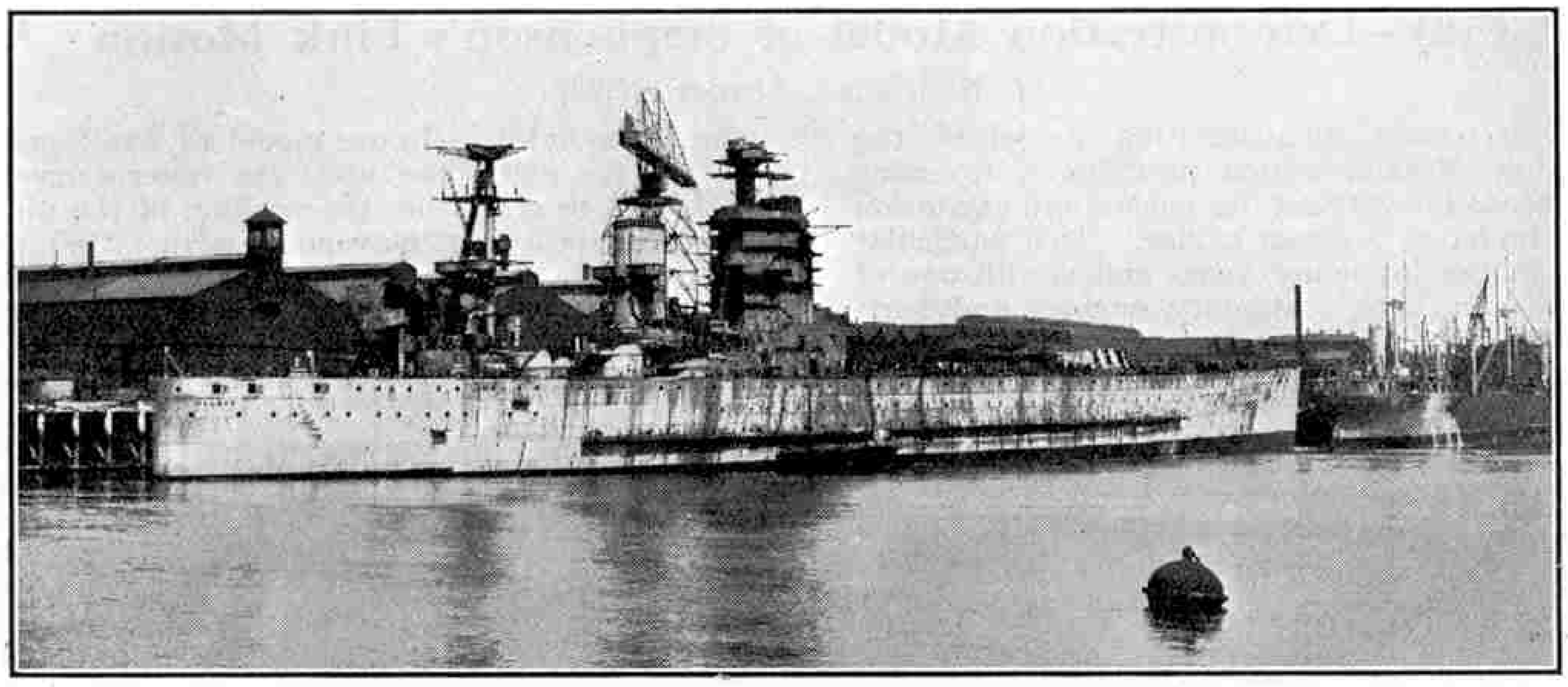
Floating Dock for French Government

The new floating dock under construction for the French Government at the Hamburg shipyard of the Vulkan works was launched recently. When complete it will have a capacity of 35,000 tons and will be stationed at Port Autonome, near Bordeaux. It will be approximately 715 ft. in length and 117 ft. in width and will be able to accommodate vessels drawing 28½ ft. of water. It is fitted with six electrically-operated pumps that will "lift" the dock in two hours.

* * * *

With the object of facilitating repairs to small vessels calling at Table Bay, South Africa, a new floating dock with a lifting capacity of between 450 and 500 tons has been added to the dry dock equipment. It is 137½ ft. in length and 40 ft. in breadth, and will submerge to a depth of 15 ft.

Britain's New Battleship Nearing Completion



Launched from the naval yard of Sir W. G. Armstrong Whitworth & Co. Ltd., Newcastle-on-Tyne by Dame Caroline Bridgeman (wife of the first Lord of the Admiralty) on 3rd September 1925, the new British battleship "Nelson," is now approaching completion.

The "Nelson" was the first battleship to be designed since the war and is the first to be built under the Washington Treaty. It has a displacement of 38,000 tons—the prescribed limit—and embodies the lessons of Jutland.

Meccano Worm Gear

Suggestions Section

Edited by "Spanner"

(58)—Demonstration Model of Stephenson's Link Motion

(*J. S. Watson, London, N.22*)

FIG. 58 shows an interesting demonstration model of the "Stephenson" Link Motion, which provides a reversing gear as well as a means for varying the cut-off and expansion of the steam in the cylinder of a steam engine. This particular Link Motion has been in use for many years and is still one of the most popular types for both stationary engines and locomotives. We strongly recommend readers to construct and study the model carefully; the few hours so occupied will be well and profitably spent. Some valuable information may be obtained, also, by comparing this apparatus with the Meccano model of Walschaerts' Valve Gear (see Standard Mechanism No. 277).

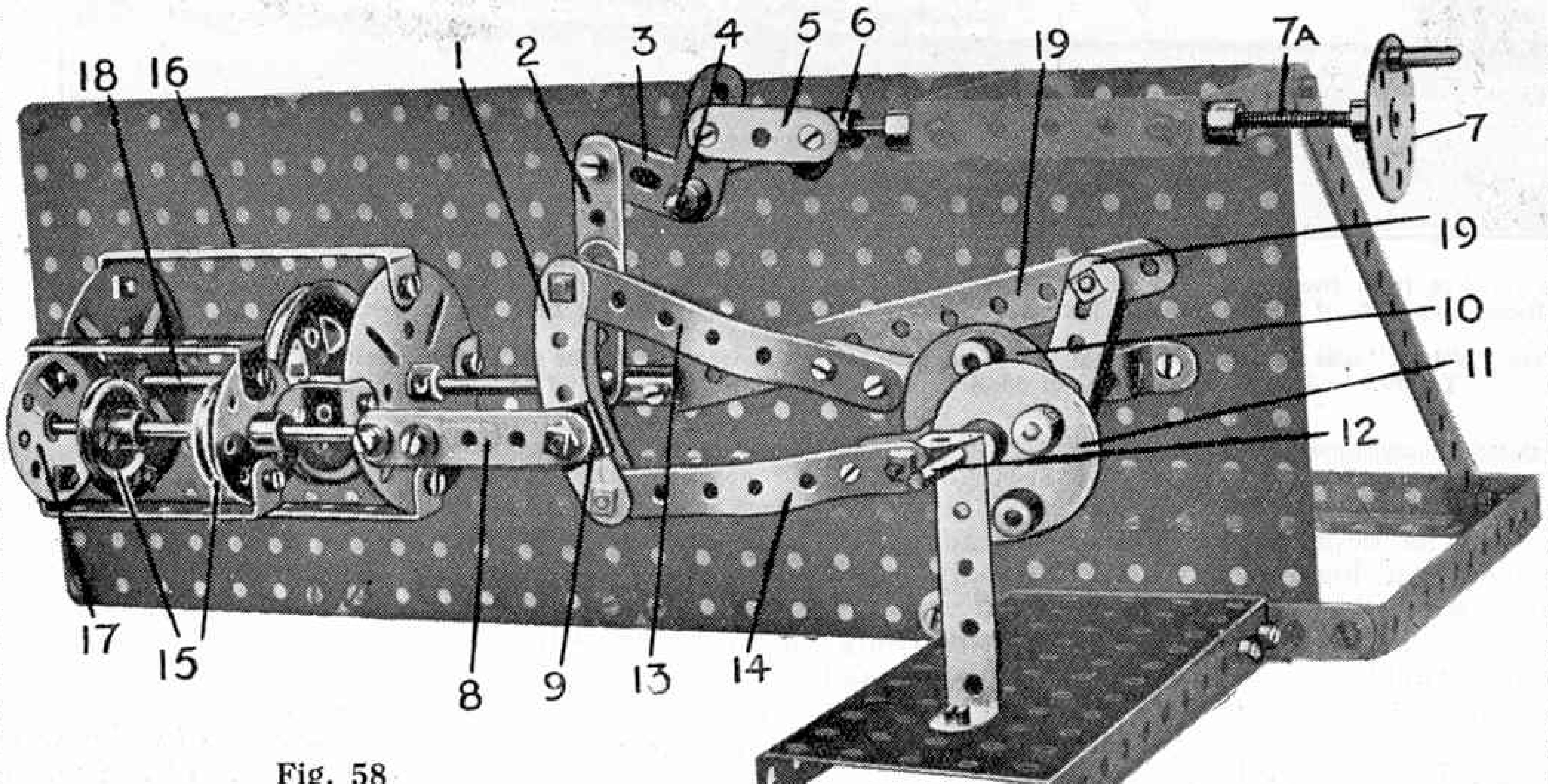


Fig. 58
General Arrangement of the Gear

The principal components of Stephenson's Link Motion are reproduced in the Meccano model as follows:—The expansion link 1 is built up from two 2½″ Curved Strips (No. 90, large radius) secured and spaced apart at top and bottom by nuts placed on the shanks of ⅜″ Bolts. On the centre of these bolts, loosely mounted between the two inner spacing nuts, are the eccentric rods 13 and 14 (3½″ Strips). These are bolted at their other ends to the Eccentrics 10 and 11 which are secured to the main driving axle 12 by the bosses nearest their centres, giving a throw to each Eccentric of ½″. The Eccentrics are placed in opposite positions, so that as one pushes the expansion link forward the other pulls it back. The Strips 13 and 14 should be bent slightly towards each other at their outer ends in order to bring them to the centre of the link 1.

A Pivot Bolt passes through the centre hole of the rear 2½″ Curved Strip in the expansion link, and is secured in the boss of a Crank bolted to the 2″ Strip 2 forming the suspension link. The latter is attached pivotally by means of bolt and lock-nuts to one arm of the Boss Bell Crank 3. This is secured to the shank of another Pivot Bolt 4 journalled through the outer end of a 2½″ × ½″ Double Angle Strip, the other end of which is bolted to the rear framework. One end of a 1½″ Strip 5 is rigidly bolted to the Threaded Boss 6, Washers being placed upon the bolt to make sure that it does not touch the Threaded Rod on which the boss moves, whilst its other end is loosely connected by bolt and lock-nuts to the elongated hole in the upper arm of the Bell Crank. On operation of the hand-wheel 7, the Threaded Boss 6 is caused to travel to and fro along the Threaded Rod 7a, thus rocking the Bell Crank 3 about its pivot 4. In the case of a locomotive the hand wheel is placed in a convenient handling position in the driver's cab.

The piston valves, represented by 1″ Pulley Wheels 15, are connected by means of the 2½″ Strip 8 (bolted to a Coupling mounted on the end of the valve spindle) to a die, or block, 9 sliding in the slot of the link 1. In our model an Eye Piece fulfils the functions of the die and slides upon the outer Curved Strip of the link.

It will be seen from the position of the die 9 in Fig. 58 that a short reciprocating movement is imparted to the valve spindle through the motion of the Eccentrics and expansion link. The extent of this movement varies according to the position of the Eye Piece 9 in the link 1; and the position of the Eye Piece may be altered at will by a few turns of the hand-wheel 7, since the rotation of the Rod 7a causes the suspension link 2 to raise or lower the link 1. If the die block 9 is placed in the exact centre of the link practically no traversing movement is imparted to the piston valves, for in that position the extension rod is influenced equally by both Eccentrics. This is the "neutral" position, when no steam is admitted to the cylinder. If the link is moved either up or down, the amount of travel given to the valves increases proportionately to the distance of the die from the central pivot of the link, and an increasing amount of steam is supplied to the cylinder for each stroke of the piston. Moreover, the direction of movement of the valve spindle is decided by the position of the block in the link, since the extension rod 8 follows the movement of the eccentric rod nearest to the die block.

The eccentric 10 connected to the upper portion of the link is known as the "forward" eccentric, and 11 is called the "backward" eccentric. If the link is lowered as far as possible, it will have the effect of bringing the forward eccentric rod into approximately direct line with the valve spindle, so causing the valve to be influenced by the forward eccentric. This is known as "full forward gear," and when the link is so placed the locomotive will move ahead. Similarly, if the link is raised to its fullest extent, the backward eccentric rod exercises the greater influence upon the extension rod. Consequently the order in which the valves open is reversed and the engine will run in the opposite direction. This is "full backward gear." Any position of the link may be used between either of these maximum points and "mid gear," in which the block is in the centre of the link. The movement of the extension rod along each arm of the link merely affects the amount of steam admitted to the cylinder for each stroke of the piston.

The cylinder 16 and steam chest 17 are connected by ½″ Reversed Brackets. A Rod 18, carrying a Pulley Wheel representing the piston, is attached by a Strip Coupling to the connecting rod 19. The latter is mounted on a ½″ Bolt secured in the ends of two Cranks forming part of the main axle 12. The position of the cylinder ports may be indicated by small apertures in a piece of cardboard placed between the valve chest and the cylinder.

(59)—Meccano Vice

D. F. Leaney, Shenfield; L. A. Hislam, London, S.E.4; A. Chaney, London, E.9; K. Howick, South Nutfield; M. B. Atkinson, Earby; G. Lesson, Derby; and S. Johnson, Sutton St. Edmunds.

Yet another suggested addition to the Meccano "tool-box" takes the form of the useful vice shown in Fig. 59. This model represents the combined work of the seven readers mentioned above.

The base is built up from two 5½″ Angle Girders and a 5½″ × 3½″ Flat Plate. A 3½″ × 2½″ Flanged Plate 1 is secured to a pair of Flanged Brackets 2, and is further reinforced by a 3½″ Angle Girder bolted to the base on its inner side. One end of the 4½″ Threaded Rod 3 is journalled in a 1″ × ½″ Angle Bracket 4, and a Coupling and three Washers are placed upon it between this bracket and the Angle Girder at the base of the Plate 1. The other end of the Threaded Rod is supported by another 1″ × ½″ Angle Bracket 5 bolted to the base plate beneath a 3½″ Flat Girder 6, which forms a guide for the 1½″ Angle Girders 7 bolted to the Architraves 8. These Architraves are bolted to a second 3½″ × 2½″ Flanged Plate 10 forming the movable jaw of the vice, and slide against the side 5½″ Angle Girders in the base. A 3½″ Double Angle Strip 9 is bolted to the Plate 10 and carries a Threaded Crank 11, the threaded bore of which is engaged by the Rod 3. Four Washers are used to space the Crank from the Plate 10.

The handle is formed by a short Rod 12 which slides in the end of a Coupling 13 nipped to the Threaded Rod 3. On rotation of the Rod 3 the Plate 10 is caused to gradually approach or recede from the Plate 1, so adjusting the vice to receive objects of varying sizes.

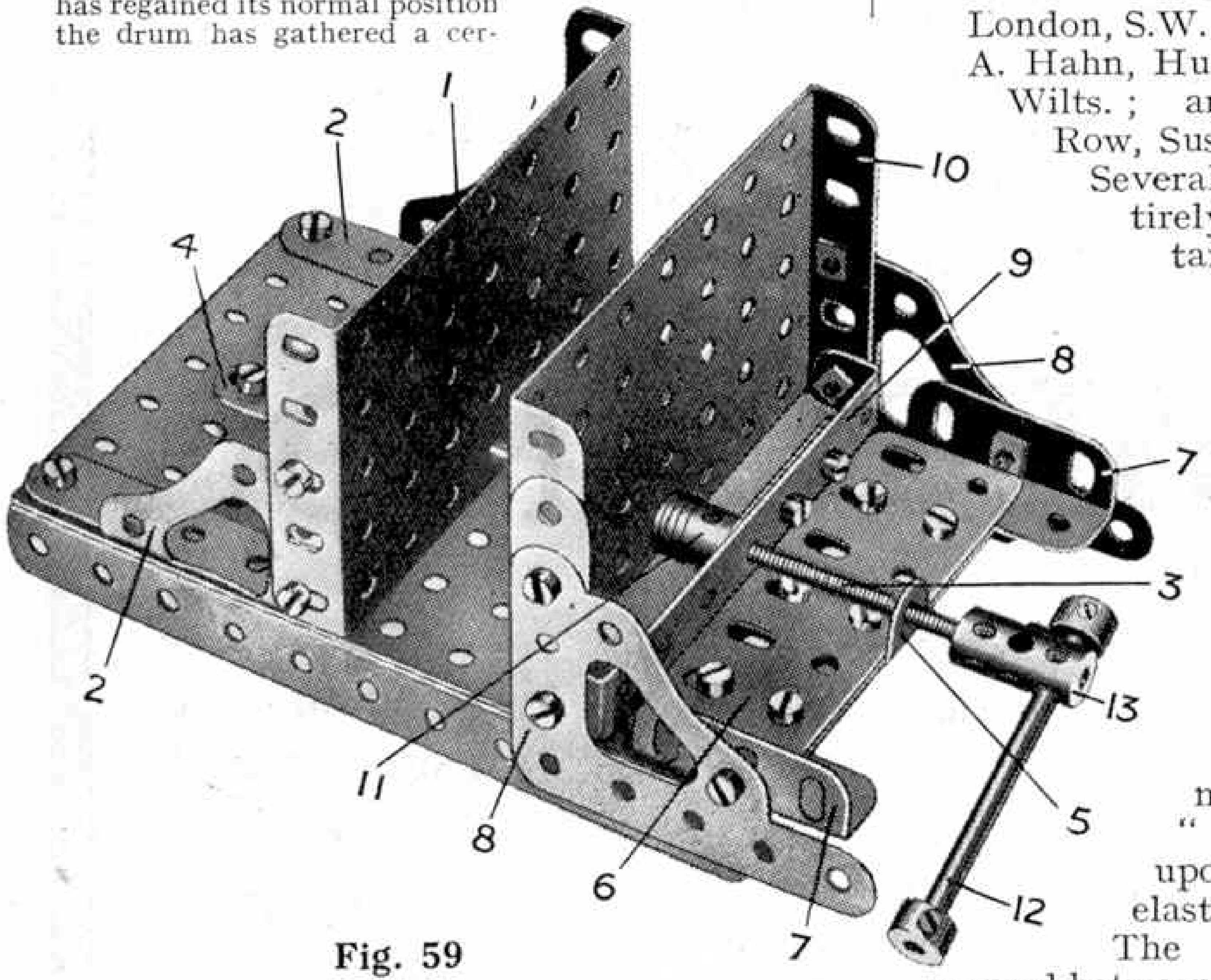


Fig. 59

Result of "Cum Bak" Competition

An unexpected number of readers succeeded in solving the problem of the "Cum Bak," which, it will be remembered, formed the subject of a novel competition announced in the Magazine for May last. The "Cum Bak" consists of a small drum, built up from Meccano parts, as shown in Fig. A. If rolled along a table or smooth floor it will always return to its starting point, although no outside influence of any kind is directed upon it, and readers were asked to explain the means by which this result was obtained.

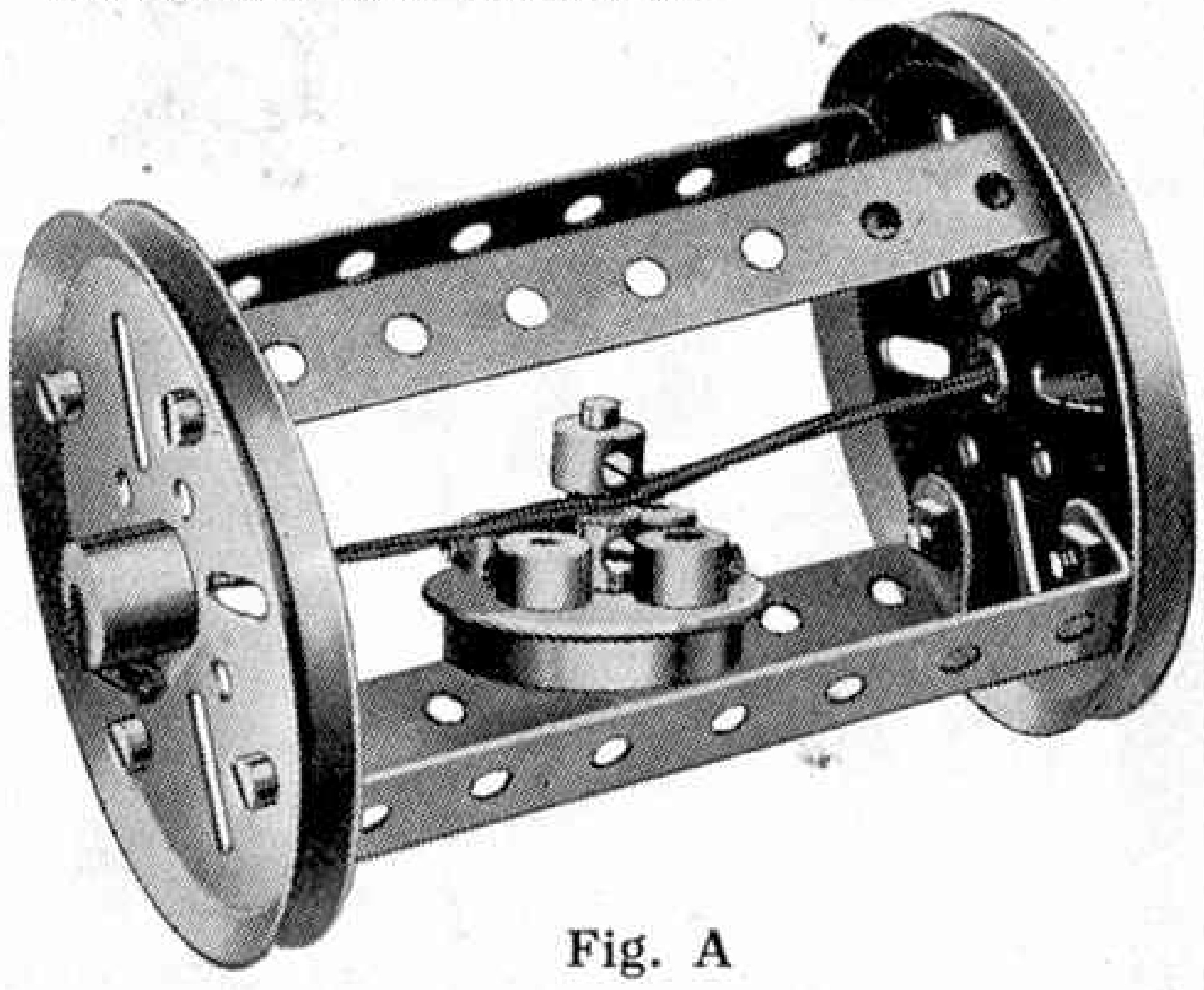


Fig. A

Owing to the large number of correct entries, we were obliged to take into consideration certain particulars, such as priority, age of the competitor, etc., in order to select the winning entry. In this way it was decided to award the prize, consisting of Meccano goods to the value of half a guinea, to Richard Hobbs, 63, Cardington Street, London, N.W.1. In addition, the following competitors will be presented with special Certificates of Merit, since their entries were amongst the earliest received and possessed particularly good points:

A. E. Evanson, Wallasey; C. Potter, London, S.W.16; J. Willis, Birmingham; A. Hahn, Hull; G. E. V. Awdry, Box, Wilts.; and T. B. Field, Forest Row, Sussex.

Several competitors adopted entirely different methods to obtain the required movement, and although some of these showed considerable ingenuity and were quite successful in operation, the alternative mechanism in every case was more complicated than the correct solution, which is shown in Fig. A.

How the Model Works

It will be seen that the mysterious antics of the "Cum Bak" depend entirely upon a short length of elastic and a suspended weight. The elastic is doubled and secured between the 3″ Pulley Wheels, from centre to centre, and the weight, consisting of any suitable Meccano parts, is attached to it in the middle of the drum. The weight illustrated comprises a Flanged Wheel carrying four Collars, the set-screws of which grip the shanks of bolts passed through the Flanged Wheel.

As the drum rolls along, the weight

(*Continued at foot of column 1*)

"Cum Bak" Competition

(*Continued from next column*)

tends to remain in its original position and the elastic therefore becomes twisted. The resistance in the elastic retards the drum to an increasing extent and finally stops it. The effort of the elastic to return to its former state then causes the drum to roll in the opposite direction. By the time the elastic has regained its normal position the drum has gathered a certain momentum, which usually carries it a little way past its starting point. It soon returns, however, and after a few short oscillations, it finally comes to rest practically at the spot from which it started its rolling movement.

The drum should be covered by thin cardboard or paper, as recommended in the May "Suggestions Section," in order to conceal the inner details. Much fun may then be obtained by mystifying one's friends with its unusual movements.

The "Cum Bak" was suggested by C. W. Beese, of Hamilton, Canada.

(60)—Another "Mystery" Model

The splendid reception accorded to the "Cum Bak" Competition prompts us to announce another contest on somewhat similar lines. Harold Dunhill, of New Southgate, London, sent in a suggestion for a simple and very effective type of Meccano reversing gear, and in reconstructing the model we found that a very interesting result could be obtained by a slight modification of our contributor's idea.

An illustration of one side of the apparatus is shown in Fig. 60. Rotation of the handle A imparts motion to the shaft carrying the wheel B, but it produces the unusual result that the latter shaft persists in turning in a clockwise direction, no matter whether the movement of the handle A is clockwise or anticlockwise. This effect puzzled even long-experienced model-builders.

Prizes Offered for Correct Solutions

The necessary mechanism by which the mystifying result is achieved has been deleted from Fig. 60, for we wish "*M.M.*" readers to think the matter out for themselves and to send in their own solutions of the problem. We may say, however, that the additional mechanism is perfectly simple and only regular Meccano parts are used. The framework shown in the illustration consists of two 3½″ × 2½″ Flanged Plates connected at top and bottom by means of two 2½″ Strips, but its design is unimportant and may be altered if desired. We shall reward the Meccano boys who correctly describe the special mechanism required, or who suggest the best means by which similar results can be obtained.

Entries in this Competition will be divided into two sections, as follows: Section A, for readers residing in the British Isles. Section B, for readers residing Overseas. A prize consisting of a selection of Meccano or Hornby goods, to be chosen by the winner, to the value of 10/6 will be presented for the best entry in each section, whilst other readers whose entries are considered to be particularly good will receive special Certificates of Merit.

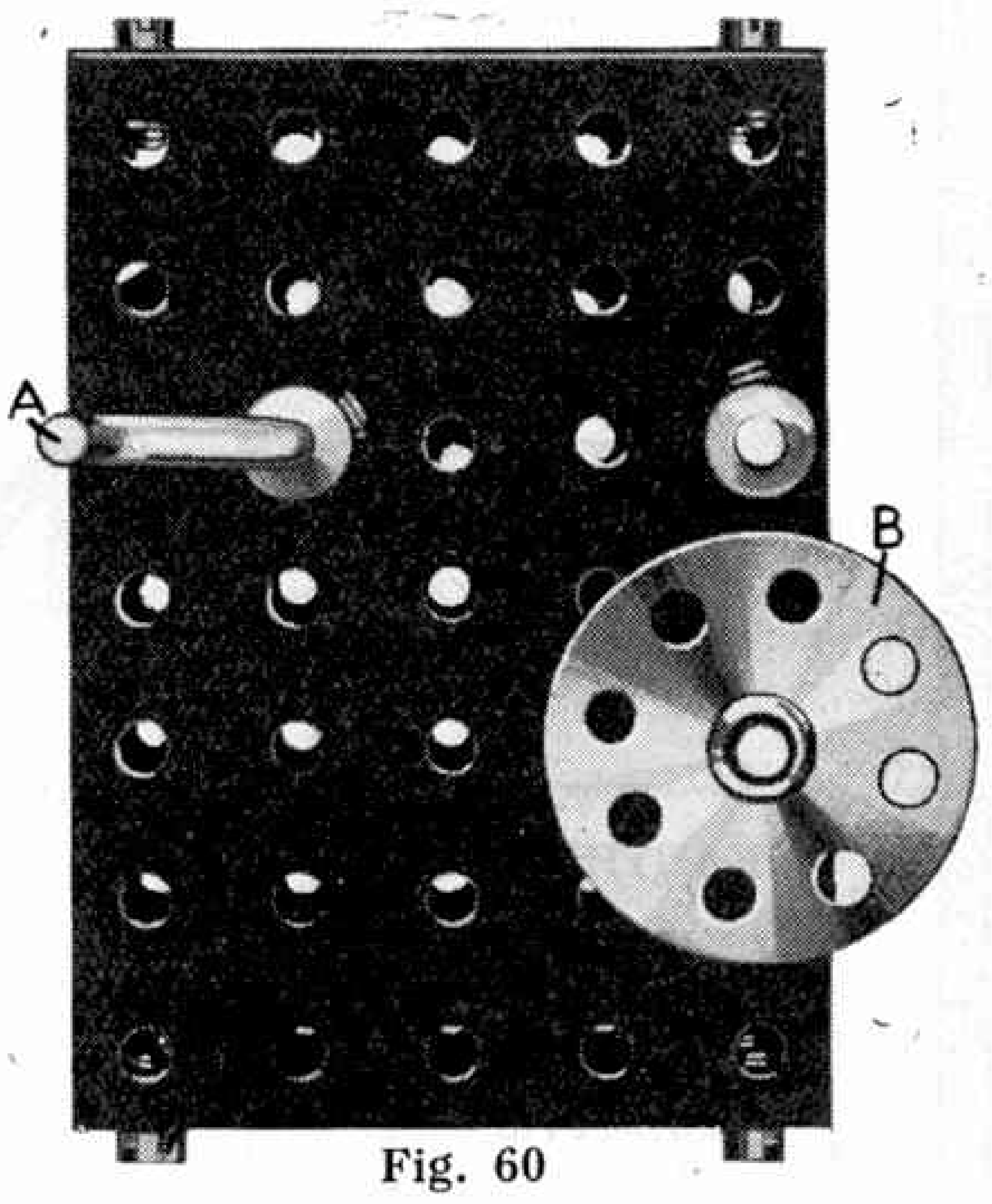


Fig. 60

The competitor's name, address, and age must appear on the back of each sheet of paper or photograph used. Entries in Section A must be received on or before the 15th November. Closing date for Section B: 20th January, 1927.

Good News!

"Let's see the colours"

These boys are all aglow with excitement over the New Meccano in Colours. The Plates enamelled in red and the Braced Girders in green, in combination with the shining steel Strips and bright brass Gear and Pulley Wheels, give a wonderful appearance to Meccano Bridges, Towers, Cranes, and the hundreds of other real engineering models that only Meccano can build.

NEW PARTS. BIGGER OUTFITS. MORE MODELS.

The principle of the Meccano system is the same as before—just as fascinating and ingenious—but the new colours are a fine improvement.

Users of the old Meccano should get the new coloured parts and begin model-building again with a new interest.

The New Meccano Book will tell you all about it—in colours. It will show the new Accessories and Outfits, as well as new models accurately constructed, just as you—and even your Dad—can construct them.

Supplies of this book will not be available until 15th November but all readers of the "*M.M.*" desiring copies should at once send in their applications together with the names and addresses of three of their chums. All requests will be dealt with in strict rotation. Send a postcard to Meccano Ltd., Dept. M.B., Binns Road, Liverpool, to-day.

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In Reply

In these columns we reply to suggestions regarding improvements or additions to the Meccano and Hornby Train systems. We receive many hundreds of such suggestions every week, and consequently we are able to publish only ideas that show particular interest or ingenuity. Every idea, however, whether acknowledged in these columns or not, is carefully examined and considered. Practical suggestions that prove to be in popular demand are marked down for adoption at the first available opportunity. It would be of great assistance if readers, when submitting suggestions for consideration, would write them on separate sheets of paper and include their name and address on each sheet used.

Suggested Meccano Improvements

ADDITIONS TO "STANDARD MECHANISMS" MANUAL.—The inclusion in the Meccano "Standard Mechanisms" Manual of a section describing in detail the use of every Meccano part would constitute a formidable task, but we shall bear your suggestion in mind. We also note your proposal that a booklet should be published dealing with the Meccano factory at Liverpool. Although it may not be possible to adopt this suggestion we may say that we hope before long to publish the history of Meccano in serial form in the Magazine, and these articles will include a description of the factory and the various processes involved in the production of Meccano and Hornby Trains. (*Reply to H. Mackle, Dublin*).

ADDITION TO CLOCKWORK MOTOR.—We do not favour the proposal regarding the extension of one of the intermediate spindles in the Clockwork Motor for use as a slow driving shaft, for only a very few revolutions could be obtained from it before expending the force of the spring. (*Reply to D. S. Ogg, Rosewood, Queensland*).

NEW PIVOT BOLT.—We note your suggestion regarding the introduction of a new bolt having its shank threaded for the greater part of its length, leaving only a very small portion smooth to act as a pivotal bearing for Strips, etc. We do not consider that such a part would possess the same range of usefulness as the existing Pivot Bolt, however. If you have any difficulty in securing pivotal connections between Strips we would refer you to Standard Mechanisms Nos. 262 and 263. (*Reply to J. Brickwell, Ipswich*).

LARGE PULLEY WHEELS.—We think part No. 19B will fulfil all the functions of your proposed part and should meet your requirements admirably. (*Reply to B. Crossland, Lancaster, and J. Grant, York*).

FLANGED CONE PULLEY.—A Cone Pulley of the type you describe for use in connection with belt transmission would be a very expensive part to produce, and on the few occasions when such a part is required existing Meccano pieces will be found to achieve the same results quite easily. (*Reply to M. Doig, Strathalbyn*).

SPRING WASHERS.—As pointed out in the "*M.M.*" for February 1926, we consider that the small compression spring fitted to the Meccano Buffers (part No. 120a) should fulfil all the functions of your proposed Spring Washer. When used for this purpose the spring should be placed on the shaft with a Washer at either end to diminish friction. (*Reply to M. Holmes, Carlisle, and R. E. Law, Ely, Cambs.*)

HAND WHEEL.—Your proposed hand wheel would be applicable to only a few models. When such a wheel is required it may be substituted by bolting several Threaded Pins to a Bush Wheel or similar part by means of Angle Brackets. (*Reply to D. Ford, Erdington*).

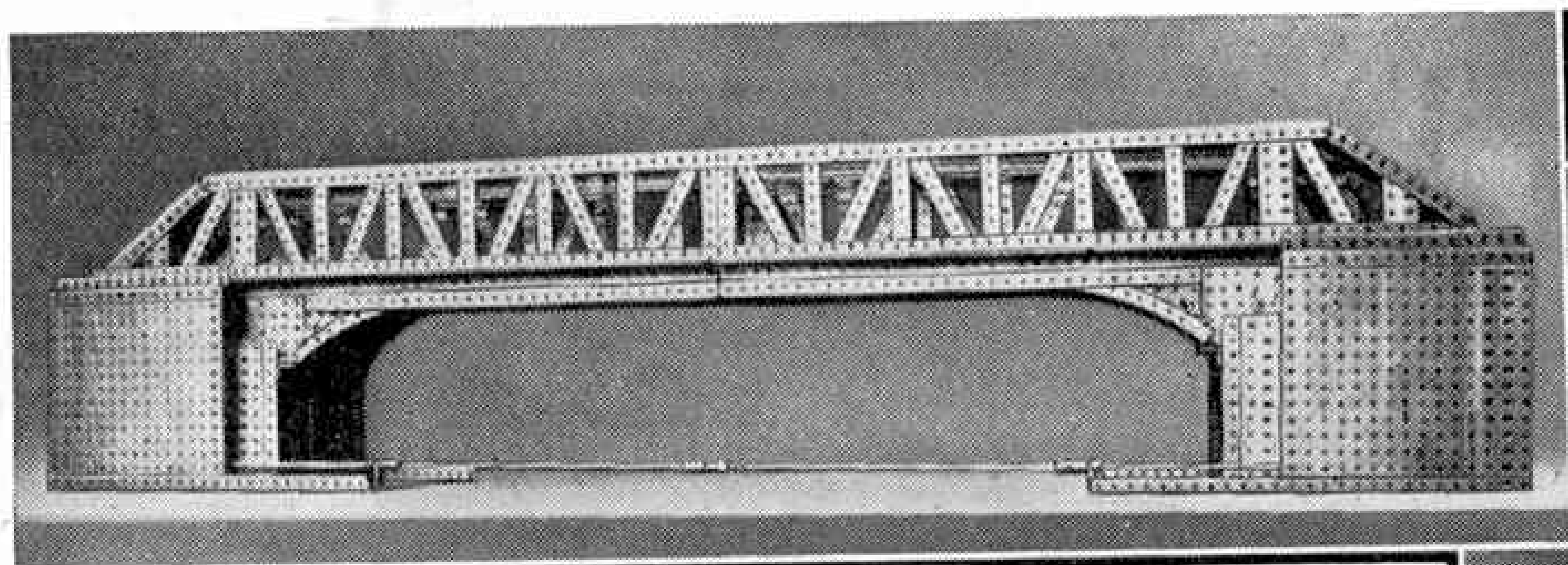
BOX SPANNER.—We shall carefully consider your suggestion regarding the introduction of a spanner of a type resembling a winding key, the hollow end of which would fit over the shank of the bolt and engage the nut. (*Reply to D. L. Venning, Thetford, Norfolk*).

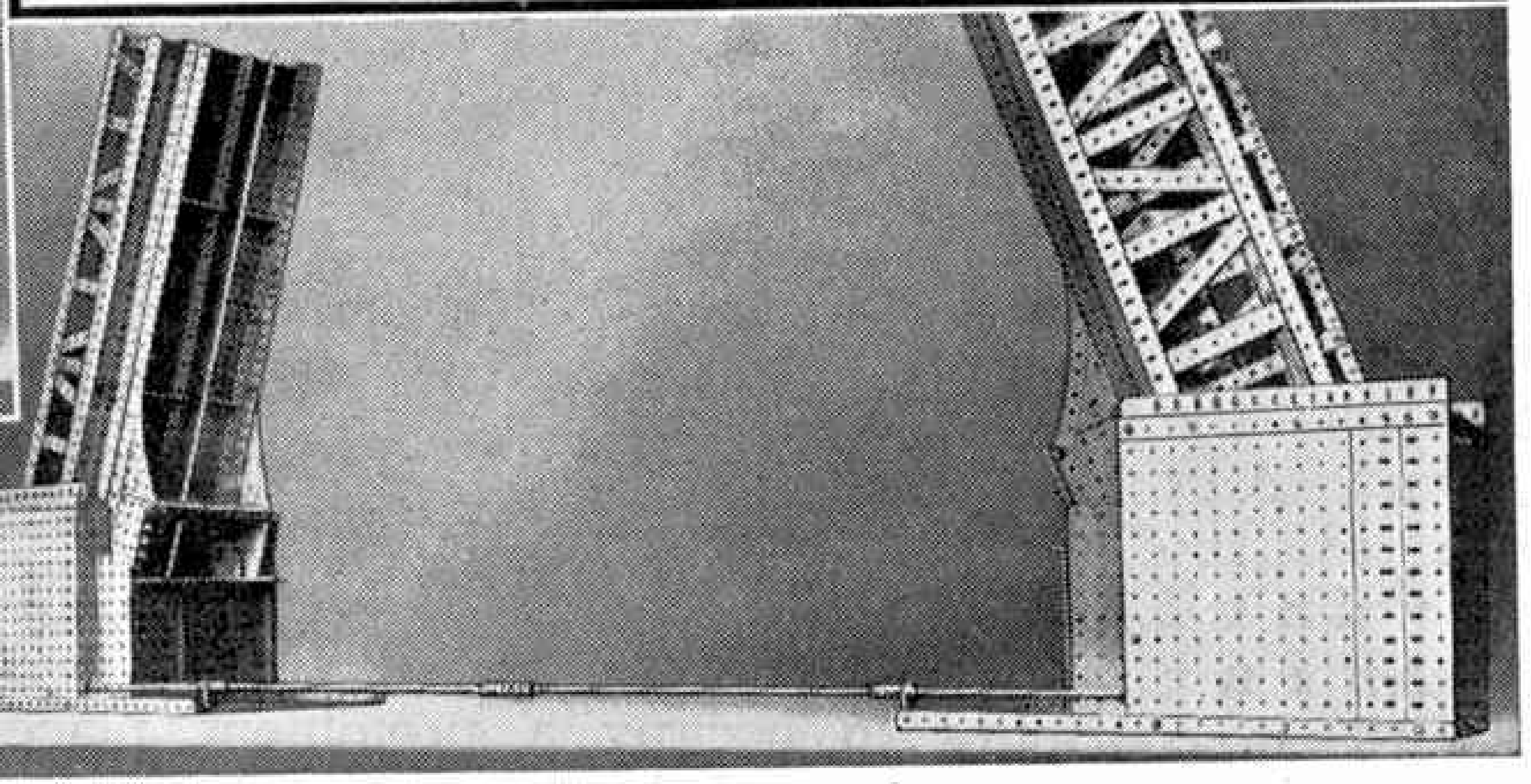
SET-SCREWS FOR HUB DISCS.—We are unable to adopt your suggestion concerning the addition of a boss and set screw to the Hub Disc, as it is frequently required to build this part into a model where a boss would be unsuitable. When it is desired to secure the Disc to an Axle Rod, it is a simple matter to bolt it first to a Bush Wheel or Face Plate, etc. (*Reply to P. Lacy, Eastbourne*).

SLEEVE COUPLINGS.—We are now carrying out experiments with a view to introducing a sleeve coupling of the type that you describe. (*Reply to H. F. Lane, c/o G.P.O., London, and A. D. Smalley, London, W.14*).

THE CHICAGO BASCULE BRIDGE IN MECCANO

This model secured Second Prize for C. P. Plantin in the recent Meccano "Bridge" Model-Building Competition.





The right-hand view shows the bridge opened to permit the passage of river traffic. The model is driven by an Electric Motor, is 4 ft. 3 ins. in total length, and has a span of 2 ft. 10 ins. Sidewalks are fitted on either side of the roadway.

IMPROVING THE "M.M."—We note your criticisms concerning the amount of space that has been devoted lately to aeronautical subjects, but we may say that these articles have proved extremely popular with a large number of readers. Nevertheless it will be only on exceptional occasions that our coloured cover will illustrate this branch of engineering. (*Reply to D. F. E. Nash, Sutton, Surrey*).

NEW "M.M." ARTICLES.—We agree that articles dealing with the Mercantile Marine and describing the functions of lighthouses, buoys, and the different types of ships and signals in use at the present time would prove extremely interesting, and we shall see what we can do in this direction in the near future. (*Reply to H. Mackle, Dublin*).

Suggested New Meccano Parts

"INTERNAL" GEAR.—Your suggestion regarding the manufacture of a large gear wheel with internal teeth will be considered carefully. With regard to your proposed angle brackets, these would fulfil no useful function that is not already provided for by the existing brackets. (*Reply to A. Viner, Coventry*).

HAND WHEELS.—There would be little demand for a specially-designed hand wheel; when this part is required it may be made to any desired size or form by securing a Threaded Pin or similar part to one of the existing wheels. See the examples of Meccano handles included in "Meccano Standard Mechanisms" (detail Nos. S.M. 255 to 259, etc.) (*Reply to A. Viner, Coventry*).

PERFORATION IN CRANK HANDLE.—See our remarks on this subject in the September Magazine. (*Reply to N. Summerhayes, Bexhill-on-Sea*).

FLANGED AND GROOVED WHEELS.—We note that you prefer the old-style Flanged Wheel (fitted with a groove) to the new, but we think that if the matter were put to the vote our readers would decide in favour of the new part. (*Reply to S. Rodbourne, Stamford Hill, N.15, and L. Ison, Northcote, Victoria*).

SQUARE-HEADED BOLTS.—These would prove more expensive to manufacture than the ordinary circular bolts, and for this reason their introduction cannot be recommended. (*Reply to F. Aston, Palmerston, N., N.Z.*)

DOUBLE CONTRATE WHEEL.—We regret that the introduction of a Contrate Wheel of the type that you describe is not practicable. (*Reply to A. W. Marshall, Southsea*).

POINTER.—See our reply under this heading in the March "*M.M.*" (*Reply to R. E. McGee, Hamilton, Ont.*)

WHEEL FLANGE.—The centre of this part is perforated to fit over the boss of a 3" Pulley Wheel. (*Reply to D. C. Rodger, London, W.4*).

LAMINATED SPRINGS.—We do not think it advisable to introduce these parts to the Meccano system. Laminated springs may be constructed by using a series of Strips, each a little shorter than the other; see Standard Mechanisms Nos. 115 and 253. (*Reply to H. C. H. Kerr, Fichley, N.3*).

NEW HINGES.—Your suggestions regarding the design of hinges with longer arms and the introduction of the "gate" type, etc., will receive further consideration. (*Reply to L. Ison, Northcote, Victoria*).

RACK SEGMENTS.—The addition of holes in the Rack Segments would offer no advantages, since it would be impossible to form a true circle by bolting these parts end to end as you suggest. When it is desired to form a circle, four Segments should be secured by their perforated arms to a Bush Wheel or Face Plate. (*Reply to L. Ison, Northcote, Victoria*).

USE OF THE ECCENTRIC.—The Meccano Eccentric has three separate bosses with set-screws, and the extent of its throw—that is, the total to and fro movement of the eccentric arm—varies according to the particular boss by which it is secured to the shaft. The different throws of the arm—½", ¾", and 1"—are all plainly marked on the face of the Eccentric. (*Reply to L. Ison, Northcote, Victoria*).

CIRCULAR SAW.—See our reply under this heading in the September "*M.M.*" (*Reply to J. R. Grimsdell, Weymouth*).

WINDING DRUM.—A winding drum for cranes, etc., may easily be constructed from existing parts. The Meccano Wood Roller (part No. 106) secured between two Bush or 1½" Pulley Wheels forms an excellent drum, for example, while among other alternatives we would recommend the use of two Flanged Wheels butted together, or Double Angle Strips of any convenient length bolted between two Bush Wheels. (*Reply to G. James, Maryport*).

Suggested Hornby Improvements

BOGIE COACHES.—We have received a large number of suggestions regarding the introduction of eight-wheeled passenger coaches in addition to the existing Pullman Cars. We would point out, however, that the two-bogie "Metropolitan" Coaches as adapted to clockwork trains (without electric fittings) may be used as ordinary passenger rolling stock for all other Hornby trains, for they are practically identical to the ordinary passenger vehicles of the great British railways. (*Reply to E. Watson, Hebden Bridge; J. A. Ratcliffe, Erith, Kent; R. Laird, Auckland, N.Z.; D. F. E. Nash, Sutton; W. R. Tomkins, Norbury, S.W.16; S. C. Smith, S. Tottenham, N.15; B. Morris, Treforest, Glam.; J. C. Luker, Petersfield; G. Innes, Maida Vale, W.9; J. H. Neville, Darlington, W. Australia; L. Harris, Belfast; and H. Helliwell, Sheffield*).

LEVERS ON POINTS.—We find there are few occasions where a point is required with the lever on the opposite or curved rail side of the straight track. More often than not the curved rail is directed towards the centre of the layout and it is more convenient to have the operating lever on the exterior. (*Reply to J. A. Wallace, Leith*).

IMPROVED VIADUCTS.—Your criticisms concerning the Hornby Viaduct are appreciated. The points you mention have already been pointed out by several readers and the possibility of re-designing this accessory will be carefully examined at the first opportunity. (*Reply to S. G. Joscelyne, Liverpool*).

The Conquest of the Air

XVIII. The Gloster "Gamecock"

THIS single-seater fighting aeroplane has many novel features and its racy appearance and clean-cut lines cannot fail to make a direct appeal.

The manufacturers of the Gloster "Gamecock," the Gloucestershire Aircraft Co. Ltd. of Cheltenham, have specialised for many years in the design and construction of machines of the single-seater "Scout" class, and the results of their extensive experience have been applied in producing a number of single-seaters that have achieved remarkable successes. Of these the "Grebe," for instance, is a striking example. Adopted in 1924 by the Royal Air Force as the standard fighting "Scout," it continues to occupy a prominent place in the equipment of the Royal Air Force.

Courtesy] The Gloster "Gamecock" in flight ["Flight"

The "Grebe" type of construction embodied many novel features that have been thoroughly tested out in service and have earned for the machine a wide reputation as a highly efficient fighting aeroplane. The type has now been further developed and has resulted in the production of the Gloster "Gamecock," which machine has been adopted as the standard single-seater fighter for the 1926 programme of the Royal Air Force.

The "Gamecock" is designed for work at high altitudes. It is fitted with a 420 h.p. Bristol "Jupiter" engine with variable timing, and has a wide range of speed, its maximum speed being 159 m.p.h. at 5,000 ft. and landing speed of 52 m.p.h. The machine can climb to 15,000 ft. in 10 minutes, to 20,000 ft. in 18 minutes, and has a "ceiling" of 26,000 ft.

Previous articles in the "Conquest of the Air" series have appeared as under :—

1.	The Lympne Trial for Light Monoplanes ...	March 1925
2.	Beardmore "Wee Bee I."	April ,,
3.	Super-Seaplanes for U.S. Navy	May ,,
4.	Argentine Airman's Attempt to Circle the Earth	June ,,
5.	Parnall "Pixie III."	July ,,
6.	De Havilland "Moth"	August ,,
7.	Beardmore-Rohrbach All-Metal Flying Boat ...	October ,,
8.	Fokker C.V. Scout	November ,,
9.	Vickers "Vimy" Ambulance	December ,,
10.	The Cierva Auto-Giro Flying Machine	January 1926
11.	Boulton "Bugle"	February ,,
12.	The Flight from London to the Cape	March ,,
13.	Light Aeroplane Clubs	April ,,
14.	D.H. 54 (de Havilland "Highclere")	May ,,
15.	Vickers (Rolls-Royce) "Vanguard"	June ,,
16.	De Havilland "Hercules"	August ,,
17.	Handley Page "Hampstead"	September ,,

In the design and construction of the "Gamecock" close attention has been paid to detail, with a view to reducing maintenance costs to a minimum. It is not surprising, therefore, that the equipment is a noticeable feature as, for instance, the wireless installation, which is mounted on sliding panels that may be easily pulled out clear of the machine for inspection. The gun installations, also, are a novel feature, being neatly let into the sides of the fuselage so that the guns are accessible to the pilot without his having to put his hands over the side, as often is the case. The petrol tanks are placed in the top plane, the cocks being within easy reach of the pilot in the cockpit — in fact, easy accessibility to all essential parts is one of the characteristics of the machine. The rear of the engine, the gun attachments, and the ammunition boxes are all readily accessible by easily-opened inspection doors in the side of the fuselage, thus involving the minimum inconvenience and no dismantling when inspection is desired.

The wing combination consists of a thick-section upper wing and a medium-section lower wing. The top wing is set at a slightly greater angle of incidence than the lower wing, and this setting, in conjunction with the different characteristics of the two sections used, provides certain very important features.

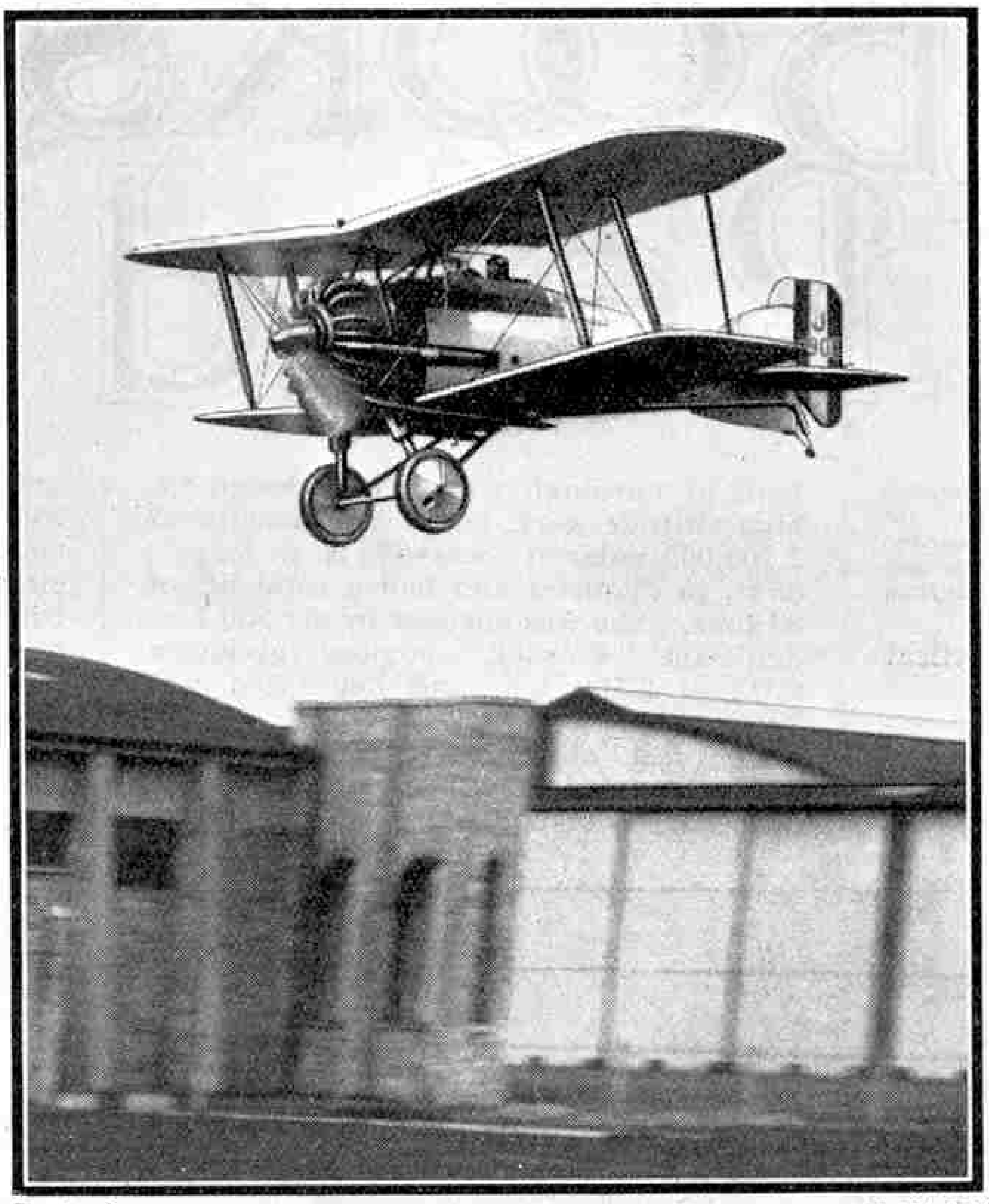
For instance, at or near the stalling angle, the two wings contribute almost equally to the lift, and the lateral control is made very effective by the special arrangement of the wing tips and ailerons. This enables the low landing speed to be attained.

The wing combination also makes possible the improved climbing speeds, and at top speed it has almost as efficient a combination as a monoplane, for the fact that the lower plane is set at a smaller angle of incidence than the top plane, causes it to contribute but little to the lift. Being of small camber it has a very low drag.

The Air Ministry specification requires the "Gamecock" to take widely different loads. These vary from 400 lbs., being the weight of the pilot and tanks half filled with fuel, to just over 1,000 lbs., the weight of the pilot, full tanks and pilot's equipment.

Although full details of the performance of the "Gamecock" may not be published at present, some of the advantages of the particular setting of the wings, and other details, may be gained from an examination of the performance of two earlier types—the "Sparrowhawk" and "Grouse," both fitted with the 230 h.p. B.R.2 Rotary engine. The "Sparrowhawk" has the normal thin-wing section in both planes, and the "Grouse" has thick-section wing in the top plane and medium-section in the bottom plane.

The weight of the "Sparrowhawk" unladen is 1,419 lbs., of the "Grouse" 1,357 lbs., the loaded weights being 2,168 lbs., and 2,106lbs. respectively. Their wing areas are 270 sq. ft. and 206 sq. ft.



Courtesy] [*"Flight"*

This snap of a Gloster "Gamecock" clearly shows the Bristol Jupiter engine

The stalling speed of the "Grouse" is 47 m.p.h. and that of the "Sparrowhawk" 51 m.p.h. The speed at ground level is 128 and 125 m.p.h.; speed at 15,000 ft. 114 m.p.h. and 111 m.p.h. respectively. To climb to 17,000 ft. the time required is 37.51 and 43 minutes respectively. Both machines carry the same load, have the same fuel capacity, and use the same propeller.

This comparison amply illustrates the superiority of the wing combination used in the "Gamecock" and "Grebe" machines over the normal thin wing sections. No doubt when it is permissible to disclose full details of the performance of the "Gamecock," this superiority will be even further apparent.

It is interesting to note that at the Royal Air Force Pageant at Hendon on 3rd July, of the eight Single Seater Squadrons participating, seven were equipped with either Gloster "Grebes" or "Gamecocks," a sufficient testimony to the quality of the Gloucestershire Aircraft Company's machines. Of a total of 180 odd machines which participated in the Pageant, no less than 71 were Gloster machines.

Ancient Engineering— *(continued from page 610)*

unknown. In a quarry near by lies another stone, hewn, but not yet separated entirely from the rock. This monolith is 69 ft. in length 14 ft. in thickness, and 17 ft. in height. Its weight is estimated at 1,500 tons. We cannot doubt that the hewers meant to incorporate it into the temple.

Dr. W. M. Thomson, who made a special study of these wonderful ruins, was impressed not more by the mere size of the stones in the wall than by the perfection of their finish. "The corresponding surfaces of these enormous stones are squared so truly," he writes, "and polished so smoothly that the fit is exact. I was at first entirely deceived, and measured two as one, making it more than 120 ft. in length. The joint had to be searched for, and, when found, I could not thrust the blade of my knife between the stones. What architect," he asks, "of our day could cut and bring together with greater success gigantic blocks of marble more than sixty feet long and twelve feet square?"

A Wonderful Temple in Java

The great temple of Diana, built at Ephesus about 600 B.C., had 127 columns, each 60 ft. in height and 7 ft. in diameter, shaped from a single block of marble. The architects, Chersiphron and his son Metagenes, moved these great masses eight miles from the quarries to the temple site by enclosing them in wooden frames and rolling them across country with the help of oxen.

In Java there is the wonderful Buddhist temple of Boro-Budur, accidentally discovered by Sir Stamford Raffles a hundred years ago. It stands on an artificial hill, some 35 miles from the ancient capital of Djok-Djokarta, almost in the centre of the island, and is supposed to date from the early part of the seventh century. It is a vast pile of galleries, cupolas and spires, topped by a massive central dome 52 ft. in diameter. The structure has a base of nearly 1,000 sq. ft., greater than that of any of the Pyramids. One ascends it by a series of five terraces, each of which completely encircles the monument. Furthermore, these terraces or walks are covered in elaborate carvings, portraying the life of Gutama, the founder of the Buddhist faith. It is estimated that not less than three miles of this strange frieze is wrapped round and round the temple. In addition, every corner, every cornice, every pinnacle, and every stairway is also adorned with carvings. The Boro-Budur is a mighty monument, and its erection would tax the skill and ingenuity of the world's engineers and architects.

Electricity—(*continued from page* 613)

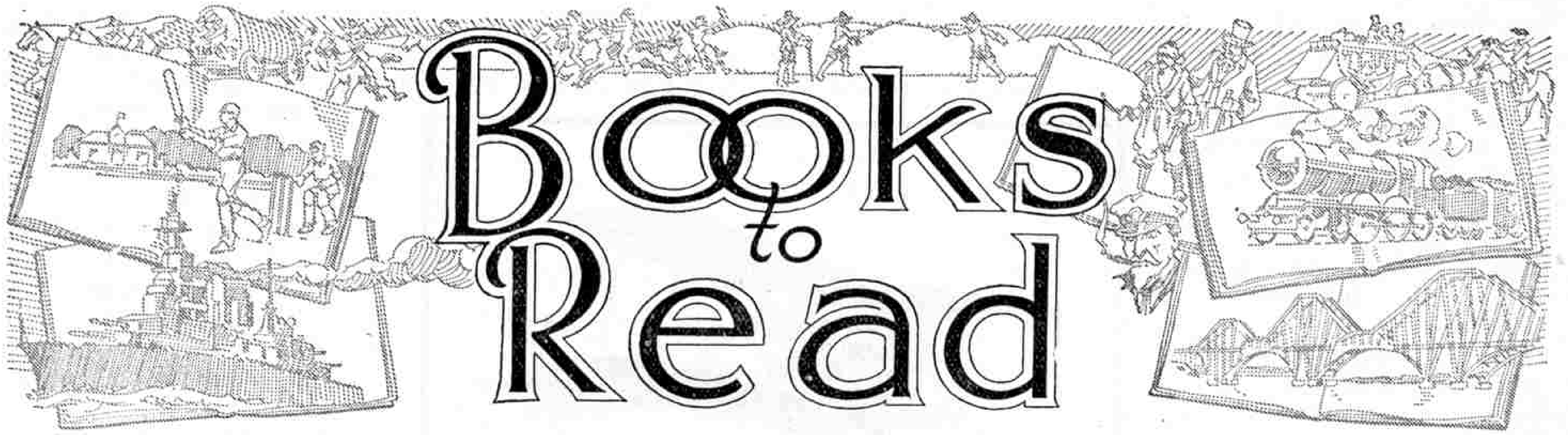
the transmitter.

A diagram showing the principle upon which the apparatus operates is shown in Fig. 2. It will be seen that the source of light is an electric bulb, the rays from which are reflected in the mirror shown and concentrated thereby upon the man's face, an image of which is to be transmitted. The light rays reflected by the face fall upon one of the sixteen lenses arranged in staggered fashion upon the revolving disc shown. These lenses focus the image upon the single selenium cell contained in the box placed behind the lens disc, and by this cell the image is translated into electric current in the usual manner and transmitted to the receiving end.

Between the lens disc and the selenium cell, however, there is a revolving disc provided with a serrated edge. The effect of this is to cut up the image into parts so that, by the combined action of the revolving lenses and these serrations, each part of the image acts upon the cell in turn, causing a corresponding fluctuating current to be produced.

The receiver is very similar in construction to the transmitter and by means of a revolving disc containing sixteen lenses the received current impulses are translated back into light rays, which are arranged so as to give a reproduction of the original image that was transmitted.

The Baird system is yet in its comparatively early stages and a great deal has still to be done before really satisfactory results are obtained. There seem to be great possibilities in the system, however, and probably before many years have passed it will have been improved so much that it will be possible to see events taking place even in Australia while we remain comfortably seated at our own firesides. It is interesting to notice that recently the British Post Office granted a license for the use of the Baird television system, this being the first system to obtain such a license.



Books to Read

Readers frequently write to me asking if I can recommend books that are both of interest and of use. On this page I review books that specially appeal to Meccano boys. I do not actually supply these books, which may be obtained either through any bookseller or direct from the publishers.—EDITOR.

"The Science of Flight and Its Practical Application," Vol. I.

By Capt. P. H. Sumner

(Crosby, Lockwood & Son. Price 16/–)

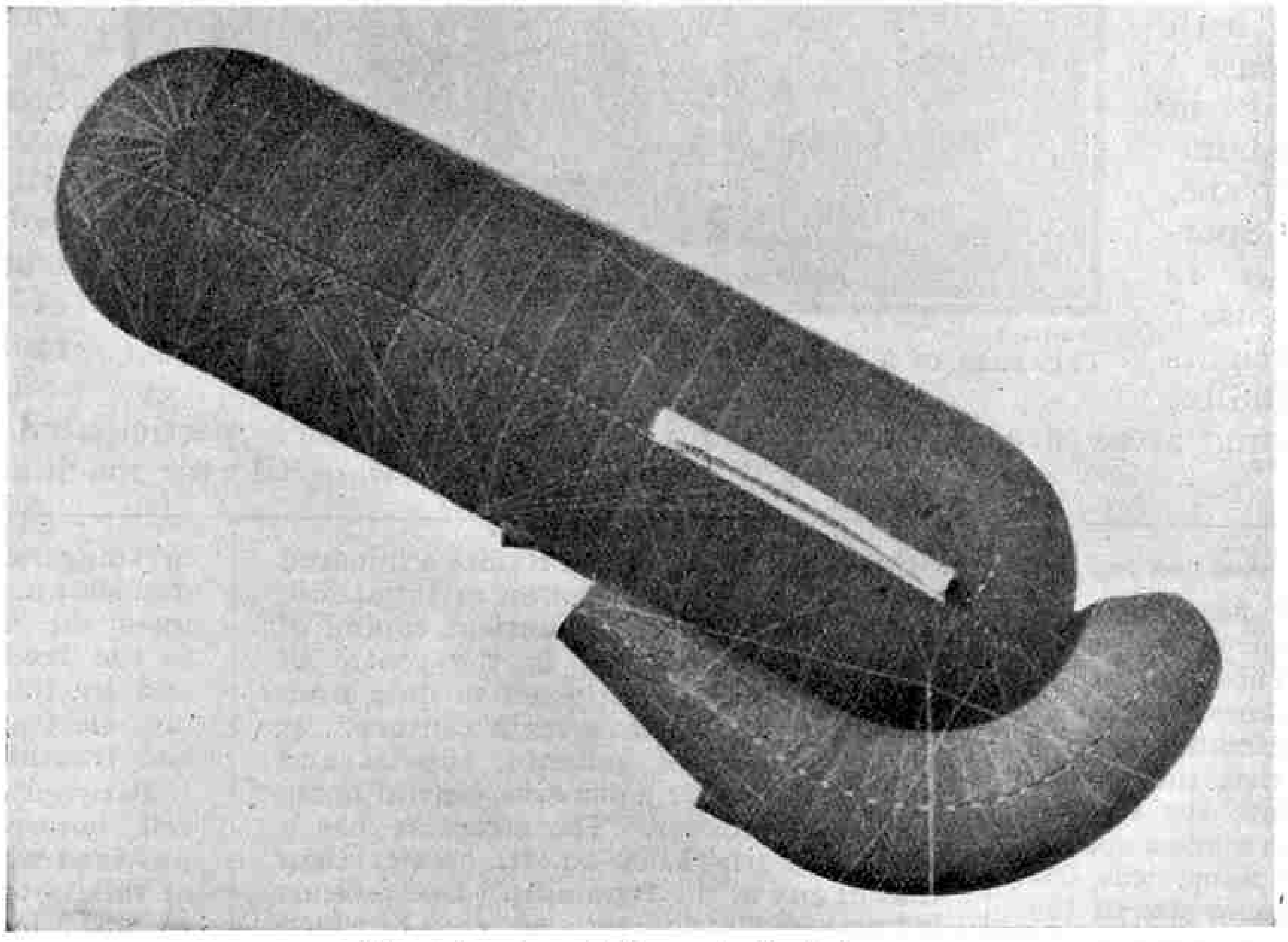
This book is to be completed in two volumes, the first volume recently published, dealing with airships and kite balloons. Volume II. is to deal with aeroplanes and seaplanes.

The author commences with a review of aerostatics, the science that deals with the movement of a solid body through air, and points out that buoyancy, weight, temperature and pressure all have an effect upon the question of flight. Some account of the early efforts to fly with lighter-than-air vessels follows, and a description of the general construction of the dirigible, the form, envelope material, rigging, control, power unit, and other interesting details all being dealt with. Gas and ballast control, and trim and buoyancy calculations are the subject of a separate chapter.

One of the most interesting chapters is that dealing with the various types and performances of airships. We learn that although practical work on the service airship in this country commenced in 1902, it was not until five years later that the first Army airship, "*Nulli Secundus*," made its appearance. This pioneer was built at the Government Air Factory, Farnborough, under the direction of Colonel Capper and Mr. S. F. Cody. She was of the semi-rigid type, 25 ft. in diameter and had a capacity of 50,000 cubic ft. Her engine was a 40 h.p. Antionette, driving two metal-bladed propellers by belts. The "*Nulli Secundus*" was wrecked in a squall and was followed by "*Nulli Secundus II.*," the envelope of which was 42 ft. in diameter and the engine was of 100 h.p. She flew from Farnborough to London in October 1907 in 3½ hours.

This was the beginning of the several army airships that culminated in the construction of airships of the famous "R" class, the first of which was the R.9 and the last the R.38. This latter airship, built at Cardington on a new design for high altitude work, had a gas capacity of 2,700,000 cubic ft., was 695 ft. in length, 85 ft. in diameter and had a total lift of 83 tons. She was engined by six 350 h.p. Sunbeam "Cossack" engines, giving a total of 2,100 h.p., and her speed was 70 m.p.h.

The last chapter of this interesting book is devoted to kite balloons or captive balloons. Kite balloons were extensively used during the war for artillery spotting, being nicknamed "sausages" owing to their peculiar appearance. As the author shows, the construction and flying of kite balloons is not such a simple matter as it might at first appear.



The Drachen "Sausage" Balloon

(From "The Science of Flight" reviewed on this page)

This book will be found of considerable interest by those of our readers who are interested in the history and technical matters concerned with flying, and it is a mine of information. We look forward with anticipation to the second volume.

* * * *

"Elementary Electrical Technology"

By A. M. Parkinson, B.S. Eng. (Lond.)

(Oxford University Press. Price 6/–)

This book, intended for engineering students, has a somewhat misleading title as it deals entirely with calculations on electric and magnetic circuits. It provides a number of formulæ for solving problems of circuits and includes, also, a series of exercises in the application of these formulæ. The first three chapters contain the fundamentals of electric circuits necessary for a three or four years' course, and the fourth and fifth chapters, together with the 19 appendices, are intended mainly for reference.

As our readers will have gathered, the book is one that is suitable for advanced students and then only in certain circumstances, as for instance when they are attending a course of lectures in electro technology, or in conjunction with another general book on the same subject.

* * * *

"Brown's Flags and Funnels"

By F. J. N. Wedge

(James Brown & Sons Ltd., Glasgow. Price 6/6)

The identification of the steamers visiting our shores is even more interesting than identifying the "home town" of motor cars by their registration letters. All readers who live at seaports or on the coast are glad to be able to identify the ships they see, and this is chiefly made possible by the flags they fly and the colour and designs of their funnels. This book shows 660 flags and funnels in colours of British and foreign steamship companies, and will be found indispensable to those interested.

* * * *

"The History of Protozoology"

By F. J. Cole

(University of London Press. Price 3/–)

This book, a reprint of two lectures delivered at the University of London last year by Professor F. J. Cole, is of particular interest to students of microscopy. The subject is, of course, one for the specialist, but there are many interesting incidents arising out of this work that have a bearing on life in general and engineering in particular. Perhaps not many of our readers would be able to suggest a connection between bacteria so small as to be visible only under a powerful microscope, and a great engineering feat, but that there may be a distinct connection is well illustrated by the construction of the Panama Canal. Had it not been for the stamping out of malaria fever, due to bacteria carried by mosquitoes, the construction of the great canal linking the Atlantic and the Pacific would have been impossible.

There are few events in the history of zoology that are more fascinating and instructive than a study and knowledge of the organisms of malaria and it is remarkable to think that the microscope made possible the construction of one of the greatest engineering achievements in recent years.

* * * *

"Erection of Engineering Structures and Plant"

By Atkin

(Published by Chapman & Hall. Price 9/6)

This book, which is of a practical character throughout, is one of the "Directly Useful Technical Series," and will be found of great service by engineers and students. The author strongly recommends that the engineering training provided by technical colleges should include instruction and practice in erection. This is an excellent suggestion, which if adopted would make students better acquainted with the problems involved in the erection of engineering structures before they undertake practical work. As this instruction is not given, some practical knowledge is necessary and it is to provide this knowledge that this book has been written. With it and some workshop experience, a draughtsman or other technical man should be able to tackle with confidence, a job of erection on the site. He should at least be able to understand that the erecting squad are doing nothing that will cause damage to property or accidents to those employed on the work. That such knowledge is desirable is evident from the fact announced in a technical paper recently that the employees of at least two reputable firms have damaged vertical boilers when lifting them by one end. This has occurred through the erector neglecting to chock the wheels of the bogie, or otherwise to control it, in consequence of which the bogie in each case ran in under the crane and let down the other end of the load.

The author mentions that it has been his experience to meet some really clever engineers in charge of the erection of plant, who were absolutely at a loss to know how to set about the job when it came to the actual handling of the parts or the tackle. Some of them had never been away from the works previously and were totally ignorant of the most elementary procedure of the manner in which to commence the work!

It is thus no exceptional thing for a trained engineer to find himself in charge of a job without the knowledge how to carry it through. Should it ever fall to the lot of any reader of the "*M.M.*" to be in a similar position, he is much more likely to come through the ordeal with flying colours if he has studied the instructions and advice given in this book. There are chapters on cranes, winches, rope and chain blocks, knots, slings and tackle, shafting, pulleys, colliery work, bridge-building, boiler fixing, and other similar subjects, and the book is well illustrated, a comprehensive index adding greatly to its value.

* * * *

"Graphical Methods of Plotting from Air Photographs"

By Lt.-Col. L. N. F. I. King, O.B.E.

(Published by H.M. Stationery Office. Price 3/- net)

The purpose of this book is to explain the principles upon which air photographs may be utilised as the basis of maps for the survey of large areas. It is not intended to be a practical guide but it deals theoretically with the methods of plotting from both vertical and oblique aerial photographs and with the means of dealing with the various errors that may arise. The procedure is somewhat complicated, but is of great interest as showing how graphical methods may be utilised to make clear the apparent mysteries of the aerial photograph.

* * * *

"The Boys' Book of Swimming"

By S. G. Hedges

(Published by James Brown & Son Ltd., Glasgow. Price 1/- net)

Many books have been written on swimming in general, but this book has been compiled specially for boys. In the course of 120 pages the author describes in the simplest possible manner the various strokes and gives practical instructions as to the best means of acquiring them. A particularly useful section of the book is devoted to various methods of life-saving according to circumstances.

The book is very fully illustrated and can be strongly recommended to all readers who wish to learn to swim or to increase the swimming skill they may have already attained.

* * * *

"Jungle Wisdom"

By V. C. Barclay

(Published by James Brown & Son Ltd., Glasgow. Price 2/- net)

This book has been specially prepared for Cubmasters. It aims at giving a better understanding of the mind of the Cub and enabling the Cubmaster to attain a wider and stronger influence, with correspondingly better results. The thoughts and feelings of the small boy are often extremely difficult to grasp. "Jungle Wisdom" goes straight for this difficulty and presents the reader with a series of vividly written discourses, mostly based on quotations from "The Jungle Book." It is a book that should make a very strong appeal to all Cubmasters.

* * * *

"Gliding and Soaring Flight"

By J. Bernard Weiss

(Published by Sampson, Low, Marston & Co. Ltd. Price 5/-)

We owe all that we know about flying to the pioneers of the art of gliding and soaring flight, or the flying of motorless aeroplanes. Among these pioneers there are none to whom more credit is due than the two brothers Lilienthal, who, as schoolboys, constructed gliders in which they learned the principles of flying. They were followed by others who had studied their work and it will be remembered that it was with gliders that Wilbur and Orville Wright made their first experiments. Shortly after, the first Gnome rotary engine was produced and was exhibited at Rheims in July 1909, and the development of the power-driven aeroplane began. The introduction of more powerful engines and the use of the aeroplane during the war diverted attention from the original gliders, but recently attention has again been paid to them, more particularly in Germany. Some remarkable gliding flights have been made, as for instance in 1922, when the best glider at a German competition remained in the air for over three hours.

To those interested in the story of man's endeavour to fly by natural methods, this little book will particularly appeal.

"The Ultimate Island"

By L. de Giberne Sieveking

(Routledge. Price 7/6)

Just as Jules Verne, in the days before we reached the age of submarines, wrote thrilling tales of ships that travelled many leagues under the sea, so in a smaller measure does the author of this book use his imagination in writing of the days to come, when air pilots are bored with the "local" routes from Berlin to London and prefer voyages further afield.

The hero of the story gives up "local" flying and takes a position as pilot with the Trans-Atlantic Air Company, thinking he will have more thrills on the giant "'planes that reach America in a day, with an average speed of 350 miles an hour"—and of course he meets even more thrills and adventures than he bargained for! All would have been well had he not struck a terrible storm when in the middle of the Atlantic, in the midst of which he finds his navigator pointing excitedly to something below them. This proves to be a strange island, or more correctly four islands, in the centre of which is a gigantic whirlpool, and, strangest of all, round the coast of the islands are clustered hundreds of ships of all sorts and sizes. Whilst the airman makes a note of the latitude and longitude of the spot, and steers to regain his correct course, off which the storm has pulled him, he puzzles over the problem of how ships could steer in to the coast with such a current running.

On his return to England the airman hears of the disappearance of a naval officer in his steam yacht, and decides that it may be possible that the yacht is one of the ships at the strange island. Accompanied by the officer's mother, in a new aeroplane, he once again sets out over the sea, this time with the mystery island as his destination. Unfortunately our hero, in descending to the island crashes badly—wakes up in hospital, and then his real adventures begin in real earnest! What the inhabitants were like—for the island was inhabited by people whose knowledge and civilisation was far beyond our own of the present day—and whether their theories and codes were excellent and just, or whether they were wrong and cruel, each reader must judge for himself, for certainly the author has embodied some startling suggestions in this exciting story.

Interesting New Books

We hope to deal with the undermentioned books in an early issue.

"THE BIG BOOK OF RAILWAYS" (Oxford University Press), 2/6
"LOCOMOTIVES OF THE WORLD" (Oxford University Press), 6/-
"AIRCRAFT OF THE WORLD" (Oxford University Press), 7/6
"GREAT BOOK OF SHIPS" (Oxford University Press), 1/6
"NEW YORK" *by* H. S. Drayton and L. B. Barratt (Mills & Boon), 7/6
"THE A.B.C. OF RELATIVITY" *by* Bertrand Russell (Kegan Paul), 4/6
"ATHLETICS" *by* Harold M. Abrahams (George G. Harrap & Co. Ltd.), 2/6
"TALES OF DISCOVERY, INVENTION AND RESEARCH" (Bailliere, Tindall & Cox), 4/6
"HEARD THIS ONE, DAD?" *by* Harold Pridham (T. Fisher Unwin), 2/-
"STEEPLEJACKS AND STEEPLEJACKING" *by* William Larkins (Jonathan Cape), 6/-
"THE EARTH AND THE STARS" *by* C. G. Abbot (Chapman & Hall), 15/-
"ANIMALS ON LAND AND SEA" *by* Austin Clark (Chapman & Hall), 15/-

Results of
Meccano Model-Building Contests
By Frank Hornby

"Machine Tool" Competition

Although the subject chosen for this competition, "Machine Tools," covers a wide field of engineering activities, the entries received included reproductions in model form of almost every type of mechanical appliance that may be classed under this heading. This fact lent additional interest to the pleasant, if lengthy, task of judging the entries, and the awards in the "Home" Section of the contest were finally allocated as follows :—

First Prize (cheque for £3-3s.) : Lindsay Davies, 60, Hagley Road, Stourbridge. Second Prize (cheque for £2-2s.) : John Sturrock, 80, Park Avenue, Barrow-in-Furness. Third Prize (cheque for £1-1s.) : Maurice King, 7, Coleridge Walk, Hampstead Garden Suburb, N.W.11.

Prizes of 10/6 each : J. Stewart, Cargo Fleet, Middlesbrough ; L. J. Smith, Neasden, N.W.10 ; J. Rowland, Watford ; W. Marsden, Ilford, Essex ; J. Lockett, Manchester ; L. D. Carter, Corsham, Wilts.

The following competitors who are amongst those gaining Certificates of Merit, have been selected as deserving special mention :—

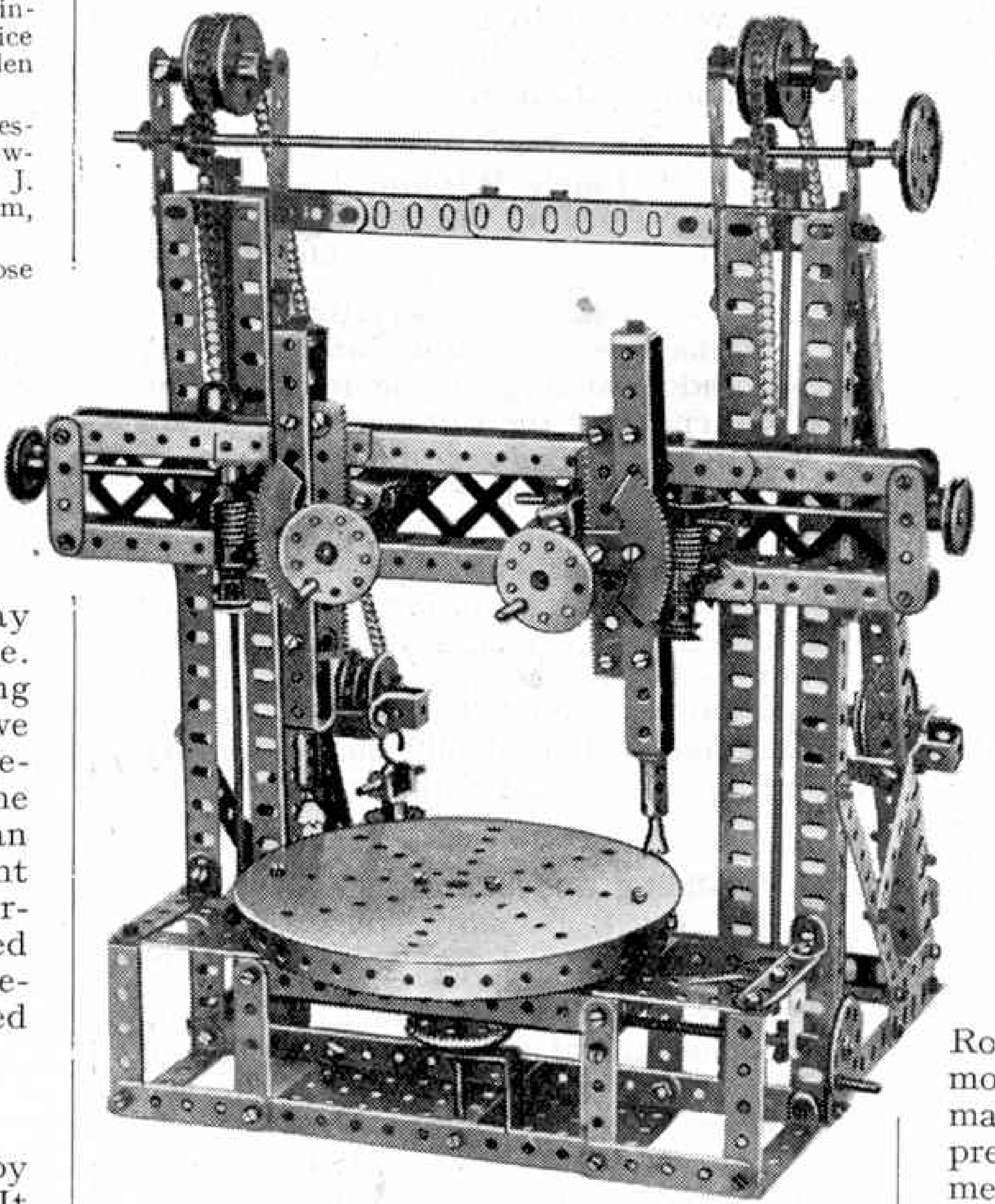
B. J. Fearnley, E. Molesey, Surrey ; W. A. Hardman, Crewe ; G. Worthington, Little Hulton, Nr. Bolton ; K. W. Cameron, Wallasey ; A. Law, Swindon ; R. Mitchell, Keighley ; W. Seaman, North Walsham, Norfolk ; J. R. Plenderleith, East Sheen ; E. Pyett, Liverpool ; S. Cook, Fulham, S.W.6 ; A. Levens, Reading ; R. Sleightholme, York ; M. Bentham, Cheadle-Hulme, Cheshire ; J. J. McManus, Derry, Ireland.

The First Prize was awarded to Lindsay Davies for a Meccano Planing Machine. This model comprises some very interesting and cleverly-designed movements, and we hope to reconstruct it in the Model Department at some future date. The table of the planer is operated by an efficient quick-return motion, the extent of its movement being regulated by altering the position of certain stops provided for the purpose, and the traversing movements of the tool saddles are controlled automatically.

Circular Planing Machine

The Second Prize-winning model, by J. Sturrock, is illustrated herewith. It represents a "Circular Planer and Propeller-boring Machine." The tool-holders may be adjusted to any angle by means of Worms engaging with Rack Segments, and they may also be raised or lowered on operation of the Pinions engaging with the Rack Strips shown. The saddles are moved along the cross-slide by means of 6″ Threaded Rods, which pass through Couplings bolted to the saddles, while the elevation of the cross-slide is regulated by vertical 11½″ Threaded Rods. These are rotated from Contrate Wheels engaging with ½″ Pinions secured to their upper ends. The weight of the cross-slide is counter-balanced by means of weights connected to the Sprocket Chains passing over guide pulleys mounted at the top of the framework.

An excellent representation of a Steam Navvy secured Third Prize for Maurice King. In this model the necessary power for the Electric Motor is supplied by an accumulator mounted in the rear of the swivelling superstructure in such a manner that it acts as a counterpoise to the weight of the jib and shovel arm. Normally the bottom of the shovel is maintained in a closed position by means of springs, and it may be opened by pulling a connecting cord. The various movements include the operation of the travelling base, swivelling movement of the superstructure, luffing, and the excavating motion of the bucket, all of which are controlled from two levers and may be operated simultaneously or independently from the motor.



Circular Planer and Propeller-boring Machine, by J. Sturrock. (Awarded Second Prize)

A prize was presented to J. Stewart for a model Slotting Machine, in which is incorporated an interesting pawl and ratchet motion imparting an intermittent rotary movement to the shaft controlling the traversing mechanism of the work-table. I hope to have something more to say regarding this model at some future date.

Rotary Shovel Excavator

L. Smith's entry is an interesting representation of a rotating Shovel Excavator of a type somewhat similar to the giant Electric Shovel described in the "Meccano Magazine" for April 1925, and on reference to this article it will be observed that this type of machine consists of a rotating wheel carrying several bucket-like containers, the sharp lips of which dig into the earth that is to be removed. The excavated material is deposited by the buckets on to a travelling belt, which conveys it to some convenient chute or transfers it to a waiting wagon or other dumping place. In Master Smith's model Hornby trucks are used to transport the waste material and readers will at once observe the many interesting possibilities of such a model if used in conjunction with a model railway. The rotary shovel is cleverly constructed from a series of Flat Brackets and 1″ Triangular Plates, etc., bolted to a Bush Wheel driven from a Meccano Clockwork Motor. The shovel arm, conveyor, and chute are mounted pivotally to a travelling base arranged to run on rails.

I am pleased to note that W. Marsden is again successful in securing a prize, for he has previously submitted some excellent work in connection with the competitions. This time his model represents a Planing Machine which, although small and compact in design, includes some interesting mechanical movements. The table carrying the work is moved very slightly to one side after each cutting stroke of the tool, the movement being effected by means of an Eccentric. The latter rocks a lever carrying a Pawl ; this engages with a Ratchet Wheel secured to the Threaded Rod on which the table is mounted by means of a Threaded Boss. By lifting the Pawl the automatic attachment is thrown out of gear and the table may be quickly moved to any position by turning a hand wheel secured to the Threaded Rod. The compact construction of the model and the good use that has been made of the available space will be appreciated from the fact that the model measures only 8″ in length and not more than 6″ or 7″ at its highest point.

Saw-Mill and Concrete Mixer

J. E. Lockett sent in a model Saw-Mill, in which the evolution of a plank of wood may be traced from its origin in the tree trunk. A series of rollers, consisting of pairs of Flanged Wheels driven through Worm and Sprocket Chain gearing from an Electric Motor, carry the rough logs to a large band saw running round two pulleys, each of which is built up from a Circular Girder bolted between two Circular Plates. Having been divided into convenient sizes, the logs are conveyed to a smaller band saw, where they are cut into planks. Next they are cut into the required lengths by a swing-saw and then passed on to a fine circular saw (represented in the model by a 3½″ Gear Wheel) for the finishing operations.

A neat reproduction of a Fowler Concrete Mixer secured an award for Lionel Carter.

Result of the "Utility" Competition

The large number of very ingenious ideas submitted in the "Utility," or "Meccano in the Home," Competition serve to demonstrate in a striking manner the practical possibilities of Meccano. One hears much talk nowadays of the "all-electric" house, but it appears that the day cannot be far distant when some enthusiastic reader will introduce the "all-Meccano" house! In any case it is quite apparent that a bright Meccano boy can very easily devise many little labour-saving appliances likely to add to the general efficiency or comfort of his home.

The results in Sections A and B are as follows :—

Section A (Boys under 12) : First Prize (Meccano products to the value of £2-2s.) : David Broadbent, "Herston," Claremont Road, Highgate, N.6 (Clock-case). Second Prize (Meccano products to the value of £1-1s.) : Arthur Backhouse, 34, Bishopgate, Wakefield, Yorks. (Candlestick). Third Prize (Meccano products to the value of 10/6) : Frank Crawley, 32, Rosenau Road, Battersea, S.W.11 (Fern Stand).

Special Commendation (Certificates of Merit) : J. Deeprose, Islington, N.1 ; H. Scott, Newton-le-Willows, Yorks. ; P. Miller, Bournemouth ; E. Stanbrook, Hendon, N.W.4.

Section B (Boys over 12 and under 16) : Prizes same as in Section A. First Prize : Hugh Mackle, 22, St. Michael's Road, Glasnevin, Dublin (Trousers Press). Second Prize (a tie ; each competitor will receive Meccano products to value of one guinea) : H. Davies, Brynclochydd, Gwytherin, Llanrwst, N. Wales (Mechanical Cycle Bell) and H. C. Thompson, 4, Montgomerie Gardens, Scotstoun, Glasgow (Picture-frame Cramp). Third Prize : D. Coxhead, 54, Leicester Road, Wanstead, E.11 (Revolving Blotter).

Consolation Prizes : (Certificates of Merit and Standard Mechanism Manual) : J. E. Park, Tooting, S.W.17 ; L. Gregg, Long Eaton, Derby ; S. Smith, Hull ; L. Doughty, Croydon ; E. Pyett, Liverpool ; J. Harris, Limpsfield ; L. Turner, Manchester.

Special Commendation : G. Noble, Newmarket ; J. Tyner, Westport, Co. Mayo ; M. I. Rowlands, Trawsfynydd, Merioneth ; H. Bayley, Exeter ; R. S. Weaver, Manchester.

Hugh Mackle, who secures First Prize in Section B, sent in two models, one of which he describes as a "Trousers Press and Hanger." This consists of two long strips (constructed by overlapping 12½" Perforated Strips) bolted pivotally to a transverse 12½" Strip, the distance between the points where they are bolted to the cross-piece being adjusted according to the width of the trouser leg. Two or three Meccano Springs, connected between each long strip and the end of the transverse strip, tend to pull the long strips outwards. The latter are inserted into one leg of the trousers and arranged to lie along the creases. The whole affair may then be hung from a Meccano Hook attached to the centre of the cross-piece. Two of these appliances are required, of course, for each pair of trousers.

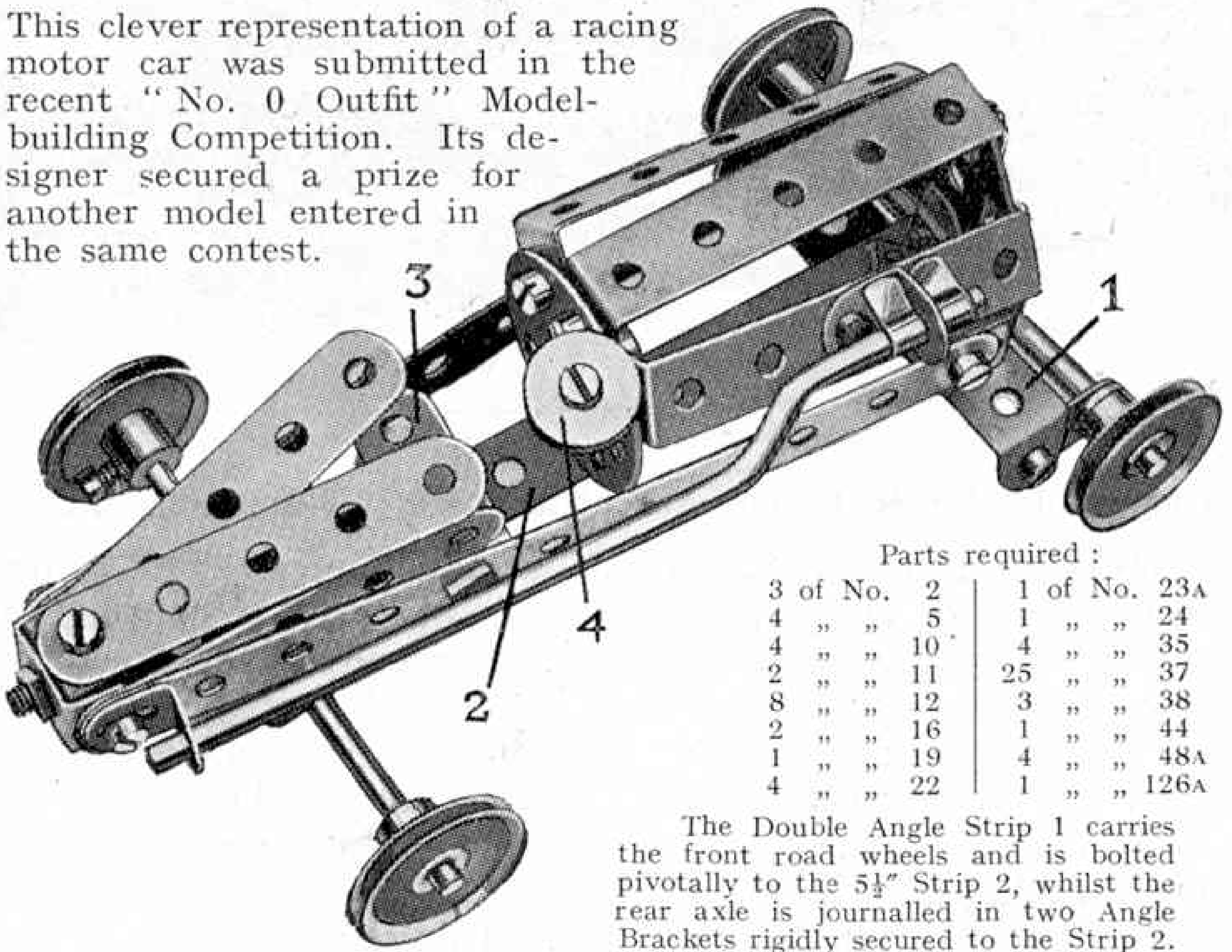
Useful Kitchen Accessory

Hugh Mackle's other model is a device by means of which the cardboard lids of milk bottles may be quickly removed. It consists principally of a small square base built up from four 2½" Strips bolted one to the other by their second holes and carrying two upright 2½" Double Angle Strips. The latter support two transverse 1½" Double Angle Strips, and through the centre holes of these is journalled a 5" Axle Rod which carries a Centre Fork in a Coupling secured to its lower end. A Meccano Spring, stretched out to form a compression spring, is placed upon the upper portion of the Axle Rod and held in position by a 1½" Pulley Wheel. To remove the lid, the instrument should be placed on the top of the milk bottle and pressure applied by the hand on the Pulley Wheel, so forcing the Centre Fork through the lid. The wheel is then given a half turn to one side and released, when the power of the spring raises the Axle Rod and Centre Fork, at the same time removing the cardboard lid. The whole operation can be performed in the space of a second.

It will be observed from the list of prize-winners that two entries tied for Second Prize. That sent in by H. A. Davies takes the form of an "Automatic Cycle Bell" which rings continuously so long as pressure is applied to a small Meccano lever attached to the handle-bars of the bicycle. It is actuated from the front road wheel by means of a small rubber-faced Pulley pressing against the rim and vibrating the bell hammer through a cam and tappet motion. (Contd. on page 654)

A RACING CAR BUILT WITH OUTFIT No. 0

This clever representation of a racing motor car was submitted in the recent "No. 0 Outfit" Model-building Competition. Its designer secured a prize for another model entered in the same contest.



Parts required :

3 of No. 2	1 of No. 23A
4 „ „ 5	1 „ „ 24
4 „ „ 10	4 „ „ 35
2 „ „ 11	25 „ „ 37
8 „ „ 12	3 „ „ 38
2 „ „ 16	1 „ „ 44
1 „ „ 19	4 „ „ 48A
4 „ „ 22	1 „ „ 126A

The Double Angle Strip 1 carries the front road wheels and is bolted pivotally to the 5½" Strip 2, whilst the rear axle is journalled in two Angle Brackets rigidly secured to the Strip 2. A Cranked Bent Strip 3 forms the seat. The Steering Wheel is represented by a ½" Pulley 4 bolted to an Angle Bracket. The appearance of the model may be greatly enhanced by fitting round rubber rings to the wheels to represent tyres. Suitable rings for this purpose may be obtained from any sewing-machine depôt.

Overseas "No. 4 Outfit" Competition

The following are the results of Section C of the "No. 4 Outfit" Competition :—

First Prize (Meccano products to the value of £2-2s.) : R. Luke, Vine Street, Blackburn, Melbourne, Australia. Second Prize (Meccano products to the value of £1-1s.) : H. Marten, 90, Chudleigh Avenue, Toronto, Canada. Third Prize (Meccano products to the value of 10/6) : A. Prince, 3767, 19th Avenue W., Point Grey, Vancouver, B.C.

Special Commendation (Certificates of Merit) : K. Gilby, Hastings, N.Z. ; F. Milligan, Takapuna, Auckland, N.Z. ; C. R. Ross, New Germany, Nova Scotia.

The First Prize-winning model represents a Lifting Bridge of a type largely used on the River Murray between Victoria and New South Wales. The central span of the bridge may be raised to allow boats to pass underneath. This movement is effected in the model by means of hoisting cords wound on drums consisting of Flanged Wheels butted together and secured to shafts journalled at the tops of vertical Girders. The latter form guides for the movable portion of the bridge. Gates are provided on the approaches to prevent the passage of road traffic when the centre span is about to be raised. The drums may be rotated from a Crank Handle mounted in a lower and more convenient part of the bridge, the connections being carried out by means of chain and Sprocket Wheels.

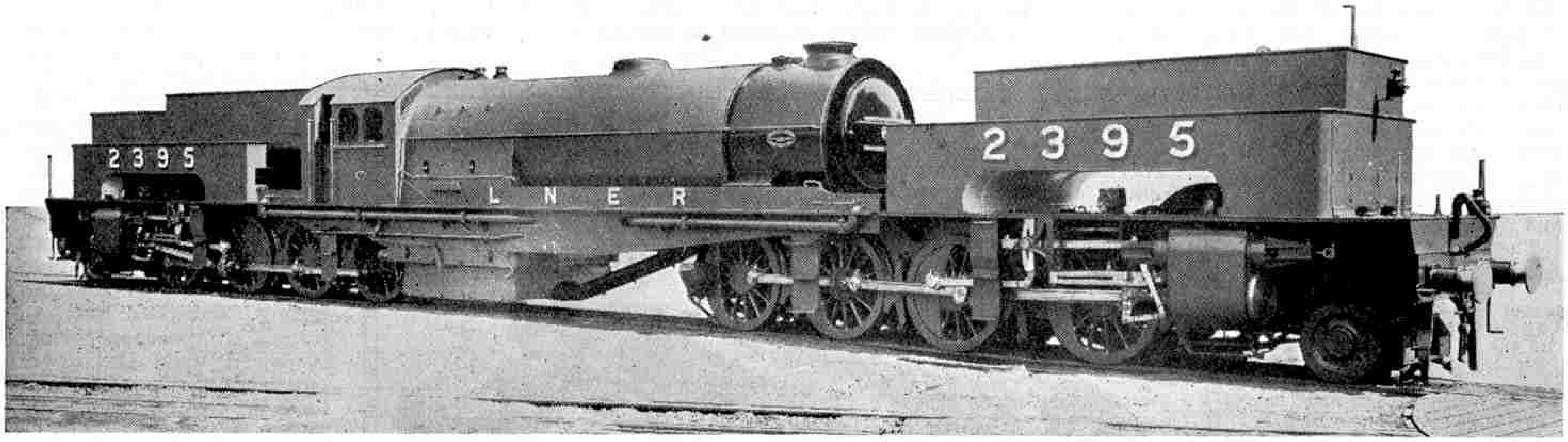
Howard Marten's entry takes the form of a Trolley-Car, or tram-car as we term such vehicles in England. It is fitted with two swivelling bogies and two trolley arms. The latter are connected together by means of cords in such a way that as one is lowered the other is raised, and *vice versa.*

The bogies deserve special mention. They are of the inside-frame type, adapted to run on gauge "0" track, such as Hornby rails, and each consists of two 2½" Strips bolted to two Double Brackets. These in turn, are bolted to a Bush Wheel, and the latter is prevented from fouling the running wheels by means of two or three Washers placed upon the shanks of the bolts. 1½" Axle Rods are journalled in the end holes of the 2½" Strips and the travelling wheels are secured to these Rods by grub screws used in place of the ordinary set-screws to obtain the necessary clearance between the frame bolts. A gong is provided for the use of the conductor.

The Third Prize has been secured by A. Prince for a Trolley Car of similar construction to the Second Prize-winning model, the principal differences in design being the provision of a spring-controlled trolley arm and outside frames for the bogies. The latter are formed from 2½" × 1" Double Angle Strips and 3½" Strips.

Classification of Locos

Using the Wheel Arrangement as a Basis

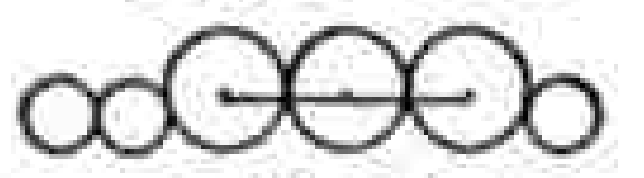
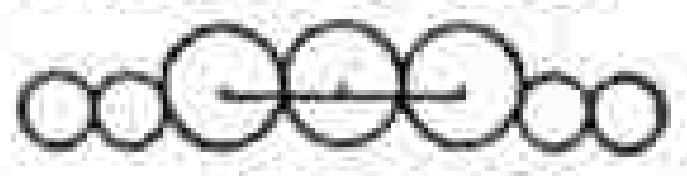
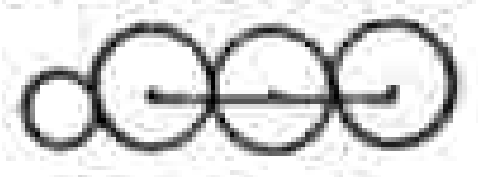
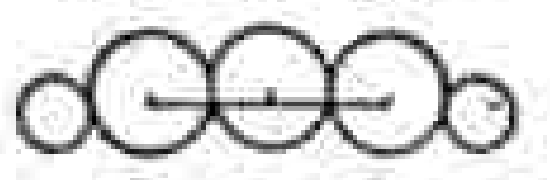
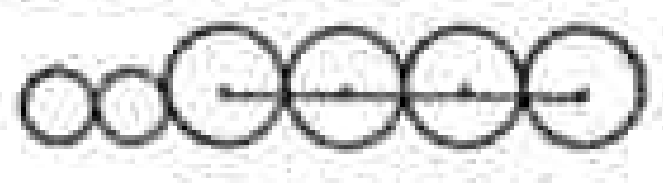
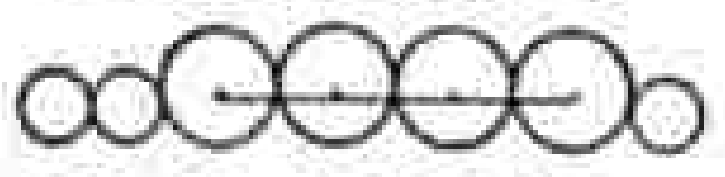
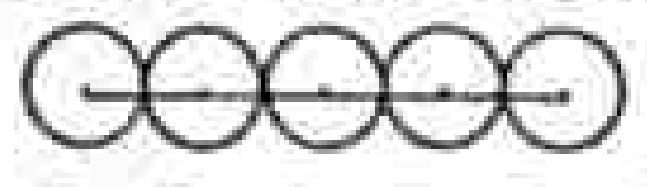
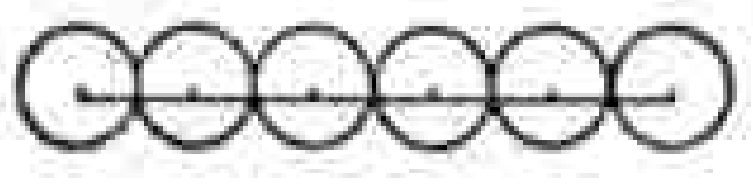


The powerful L.N.E.R. Garratt Articulated Loco (2-8-0: 0-8-2), No. 2395

THE modern method of classifying locos is based on the number and arrangement of the wheels and the normal arrangement of wheels in every loco is assumed to be:—first, leading wheels; second, coupled driving wheels; and third, trailing wheels, the wheels of tenders being left out of consideration. For instance, a loco having four leading wheels, four coupled driving wheels, and two trailing wheels would be described as being of 4–4–2 type, the figures indicating quite clearly the wheel arrangement.

If a loco has either no leading wheels or no trailing wheels, a cipher, "0," is used instead of a figure, to indicate the absence of either or both of these sets of wheels. Stephenson's famous "Rocket," the winner of the Rainhill contest, was a 0–2–2 loco, being without leading wheels and having only two driving wheels and two trailing wheels.

In France, and certain other Continental countries, a modification of this form of classification is used, the number of axles being counted instead of the number of wheels, so that the figures are halved. Thus a loco that we should describe as being of 4–4–2 type would be described in France as 2–2–1.

ARRANGEMENT	NAME	FORMULA
	ATLANTIC	4-4-2
	PACIFIC	4-6-2
	BALTIC	4-6-4
	MOGUL	2-6-0
	PRAIRIE	2-6-2
	CONSOLIDATION	2-8-0
	MIKADO	2-8-2
	MASTODON	4-8-0
	MOUNTAIN	4-8-2
	DECAPOD	0-10-0
	CENTIPEDE	0-12-0

Illustrating the classification of Locos by wheel arrangement

The "Single-Drivers" and Other Early Types

In addition to this form of classification, many of the different types of locos have been given distinctive names. Among the early types were the handsome "single-wheelers" or "single drivers," so called because they had no coupled wheels, the single pair of driving wheels being larger than the other wheels and not connected with them.

For fast running with comparatively light loads the "single-wheelers" were excellent, but they were not capable of dealing efficiently with the heavy trains of modern times. The principle that as many wheels as possible must be coupled together in order to achieve the best results is now established, and thus the "single-wheeler" has gradually disappeared. The effect of coupling wheels together is to distribute the driving force among the wheels, giving greater adhesion to the rails and greater stability.

The simplest type of "single-wheeler" was the 2–2–2, and among the last of these to be scrapped were the celebrated L.N.W.R. "*Problems*." The only other form of single-wheeler to be used extensively was the 4–2–2, and of this type a few ex-Midland, Great Central, and North Eastern locos are the sole survivors. Probably the most celebrated and graceful singles were the "8-footers" of Mr. Patrick Stirling's design on the old G.N.R., some of which locos were seen at the Darlington Centenary last year.

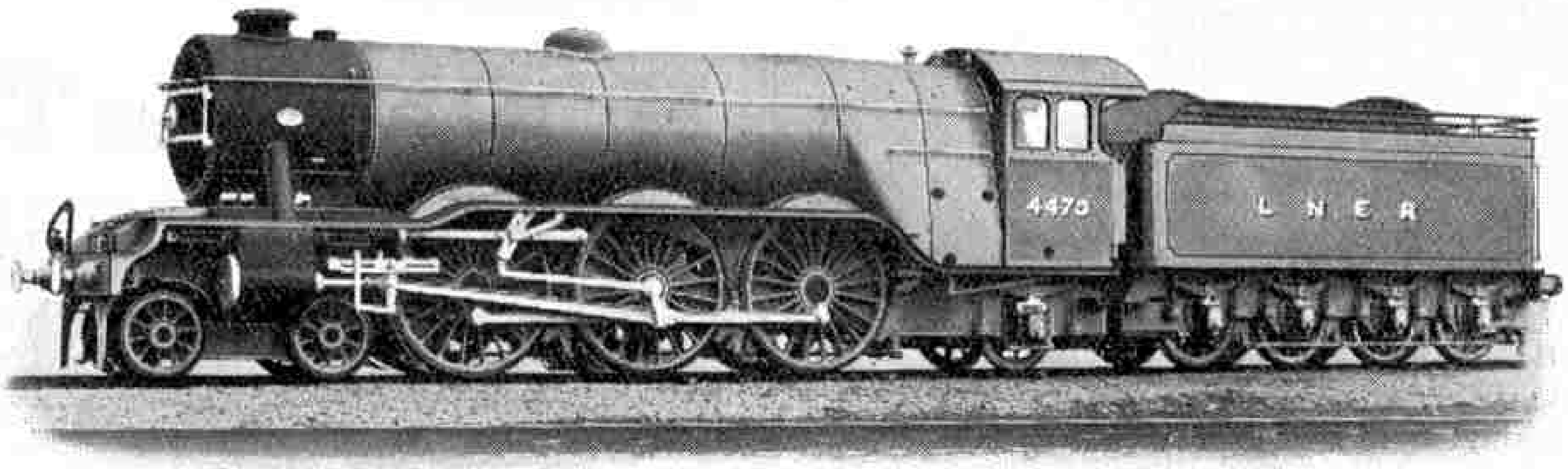
The earlier types of coupled locos were the 0–4–0, 0–4–2, and 2–4–0. Except for shunting and industrial locos the first type is obsolete, and the others are represented by an ever-decreasing family, most members of which bear honoured records. Thus a few 0–4–2 locos survive in the famous old Brighton "*Gladstones*," and also on the L. & S.W.R. section in some mixed traffic locos.

The 2–4–0's are more common, and no better representatives could be found than the favourite "*Precedents*" of the L.N.W.R. With the introduction of a leading bogie, a type regarded as the standard British passenger loco was evolved, although abroad this is known as the "American" type as its first example was built in the United States. This class is too numerous and well known to require further comment.

"Atlantics," "Pacifics," and "Moguls"

The next development of the four-coupled loco was in

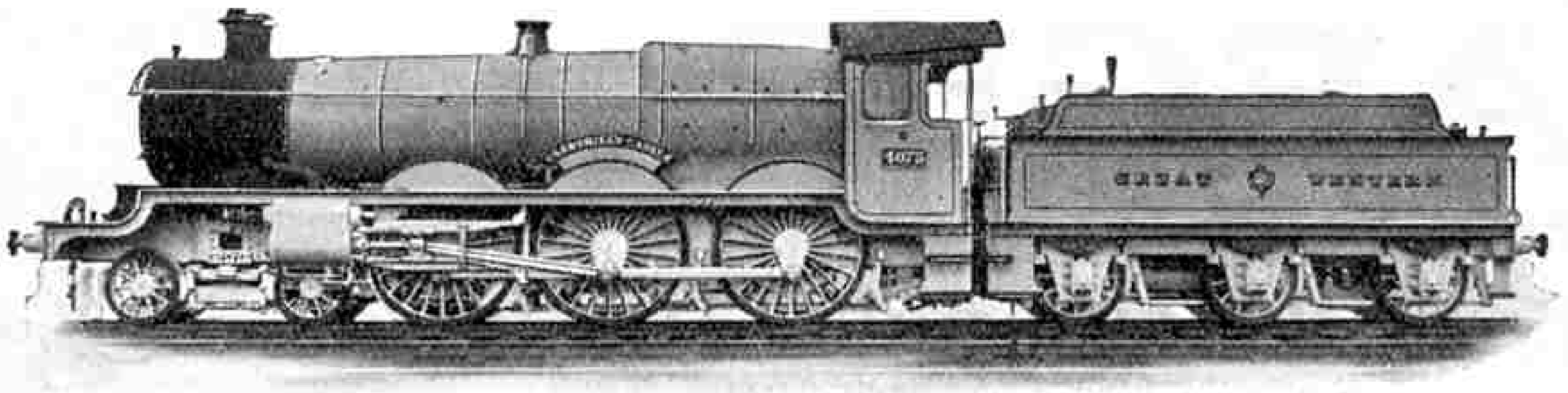
1897 when the G.N.R. introduced the first 4–4–2 "*Atlantics*," the advantage of which was in the wider firebox that could be fitted. Modern train loads are often beyond even the powers of an "Atlantic," however, and for some little time past, these locos have given pride of place to the 4–6–2 "*Pacifics*."


The L.N.E.R. "Great Northern" (4-6-2), No. 4470

The six-coupled types, all of which owe their origin to that "maid-of-all work," the 0–6–0, will never be excelled for all-round usefulness. The type is termed "*Goods*" in a general way, although its activities are by no means confined to this kind of work. The addition of a leading pony truck made possible a longer boiler and heavy outside cylinder fittings, and so developed the 2–6–0 or "Mogul" type, originated in America and imported into England in the "eighties" of last century when there was a shortage of locos on the Great Northern, Great Eastern and Midland Railways. More recently this type was revived on the G.W.R. and is now becoming increasingly popular for mixed traffic working. An additional trailing pony truck is a feature of Continental and American locos, the resulting 2–6–2 being known as the "*Prairie*" type.

The Famous G.W. "Castles"

For express or fast goods work the 4–6–0 class is in common use, and locos having this wheel arrangement are commonly referred to as "ten-wheelers." Among them are the famous Great Western "*Castles*," and the type dates back in this country to the first 4–6–0 goods engines built for the Highland Railway in 1898.


G.W.R. "Caerphilly Castle" (4-6-0), No. 4073

Nowadays, however, many designers are forsaking the 4–6–0 in order to take advantage of the much larger firebox that can be fitted to a "*Pacific*," or 4–6–2 type. Recent developments in the railway world have made this type well known and the huge boilers of its members on the L.N.E.R. have captured public imagination.

Tests were carried out last year between a G.W. "*Castle*," Loco No. 4029 "*Pendennis Castle*," which worked between King's Cross and Grantham, and the L.N.E.R. "*Pacific*," Loco No. 4474 on the G.W. line, hauling the "*Cornish Riviera*" express between Paddington and Plymouth, and were described in these pages at the time.

There are, as yet, no British tender locos of the 4–6–4 or "*Baltic*" type, although several were built for the Nord Railway of France.

"Mineral," "Mikado," and "Tank" Locos

Locos with eight wheels coupled (0–8–0) are generally referred to as being of the "*Mineral*" type, their original purpose being the haulage of slow but heavy coal and mineral trains. With a leading pair of small wheels the type becomes 2–8–0 or "*Consolidation*," another name derived from American practice.

Large numbers of locos built by the Government to the Great Central 2–8–0 design were used in France during the war. Many were not completed before the Armistice and most of these are now absorbed into the loco stock of the L.N.E.R., L.M.S., and G.W.R. The last-mentioned railway also has a fine type of 2–8–0 of its own design with coupled wheels large enough to attain a high speed with passenger trains.

The 2–8–2 or "*Mikado*" type, so called because its first representatives were built for Japan, was introduced recently into this country by a single narrow-gauge loco, one-third scale size, for the well-known 15 in. gauge Eskdale Railway in Cumberland. An entirely new design of "*Mikado*" type is now making its appearance on the L.N.E.R. and handling with great success the heavy coal trains between Peterborough and London.

Powerful locos of the 4–8–0 or "*Mastodon*" type, and the 4–8–2 or "*Mountain*" type, are used for heavy work on the *Etat* Railway of France, but these types are not represented in the United Kingdom.

Ten-coupled wheels are suitable only for special work on heavy gradients and for short runs. The Great Eastern tried a loco "*Decapod*" of this type many years ago for suburban work, the experiment showing that it was capable of more rapid acceleration than had been thought possible. The "*Decapod*" was too heavy for the track, however, and was converted into a 0–8–0 mineral loco, only to be scrapped soon afterwards. The L.M.S. have a "*Decapod*" at Bromsgrove for pushing trains up the Lickey Incline, which for two miles has a gradient of 1 in 37.

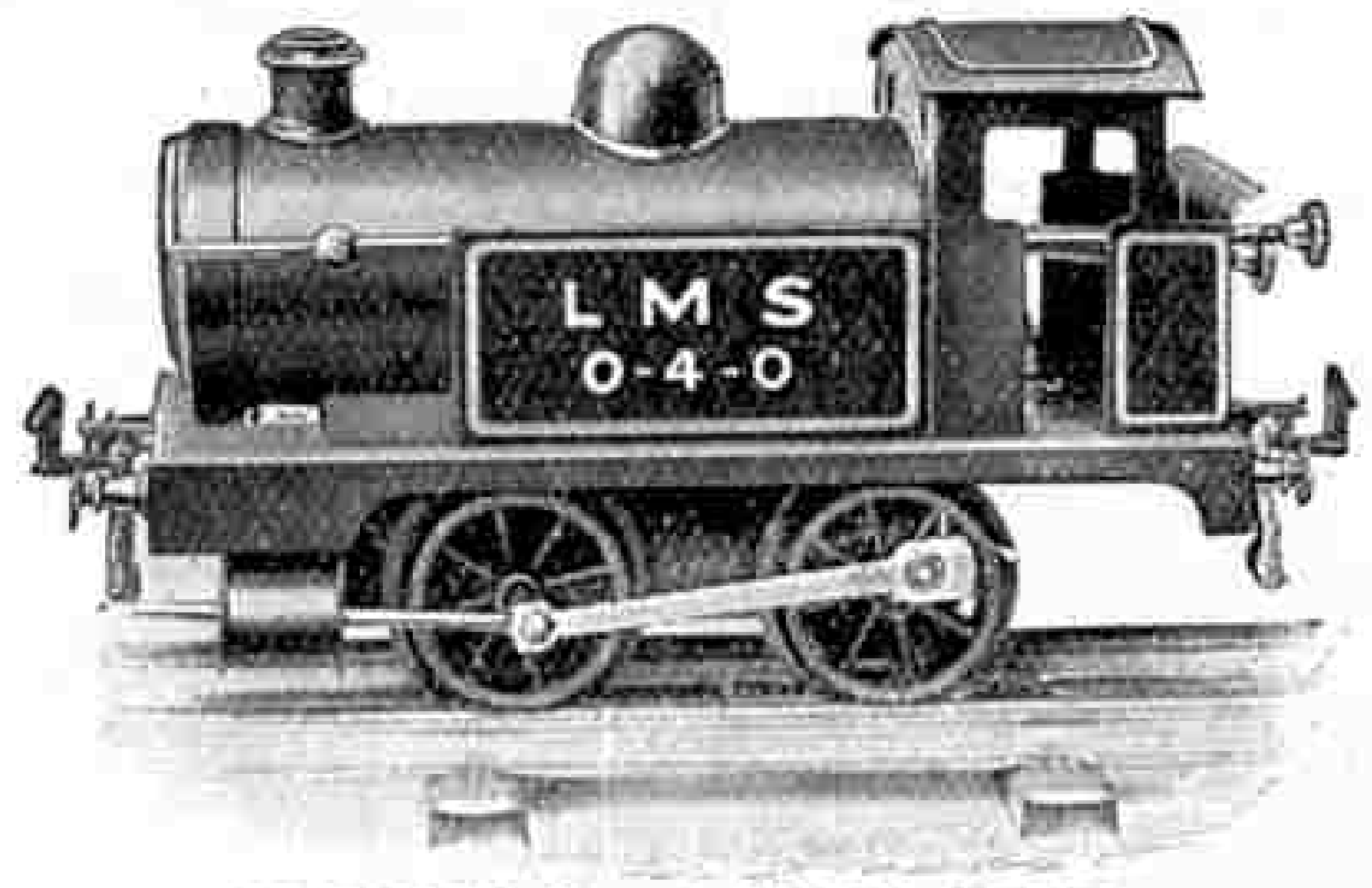
The Austrian State Railways built some 0–12–0 banking engines before the war, but there is little likelihood of any addition to these "*Centipede*" designs, at any rate for some time to come.

In the present system of classification, tank locos are distinguished from locos having tenders by placing the letter "T" below or following the classification figures, as for example 4–4–0T or 2–4–2T. Type names are not used, except in the case of the "*Baltic*" (4–6–4) and "*Prairie*" (2–6–2) types, so that a 4–4–2 Tank is not called an "*Atlantic*," but is described simply as 4–4–2T.

In the case of "articulated" locos of the "Garratt" and other types, which really consist of two locos having a single boiler, the separate engine units are regarded as having separate sets of coupled wheels. Thus, from a description such as 2–8–0 : 0–8–2, the wheel arrangement is readily understood.

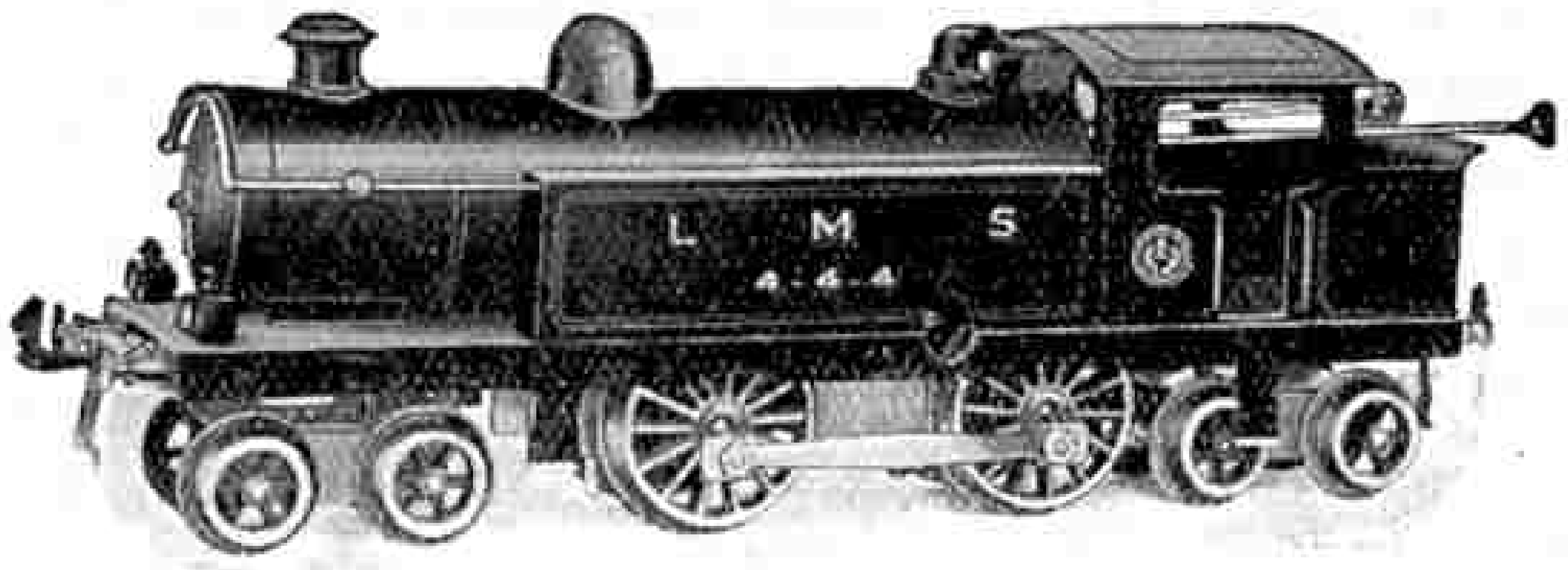
The boiler of an articulated loco is mounted at either end on swivel bearings carried in the engine units. This allows the loco to negotiate curves of small radius, notwithstanding the fact that it possesses an exceptionally large number of coupled wheels.

HORNBY TANK LOCOS



HORNBY No. 1 TANK LOCO

Strong and durable loco capable of any amount of hard work; richly enamelled and highly finished; fitted with reversing gear, brake and governor.
Gauge 0, in colours to represent L.M.S., L.N.E. or G.W. Railway Companies' Locos ... ... Price **12/6**



HORNBY No. 2 TANK LOCO

Powerful model embodying all the characteristics of the Hornby series. It is 10½" in length and is fitted at both ends with a four-wheeled bogey. Beautifully finished in colours to represent L.M.S., L.N.E. or G.W. Railway Companies' Locos, and suitably lettered. Fitted with reversing gear, brake and governor. Suitable for 2 ft. radius rails only. Price ... **30/-**

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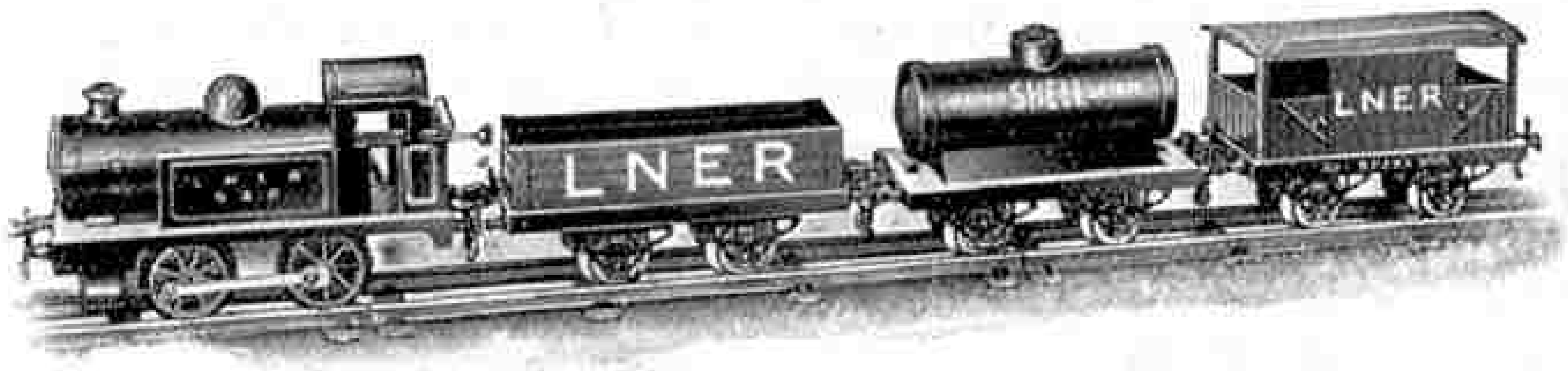

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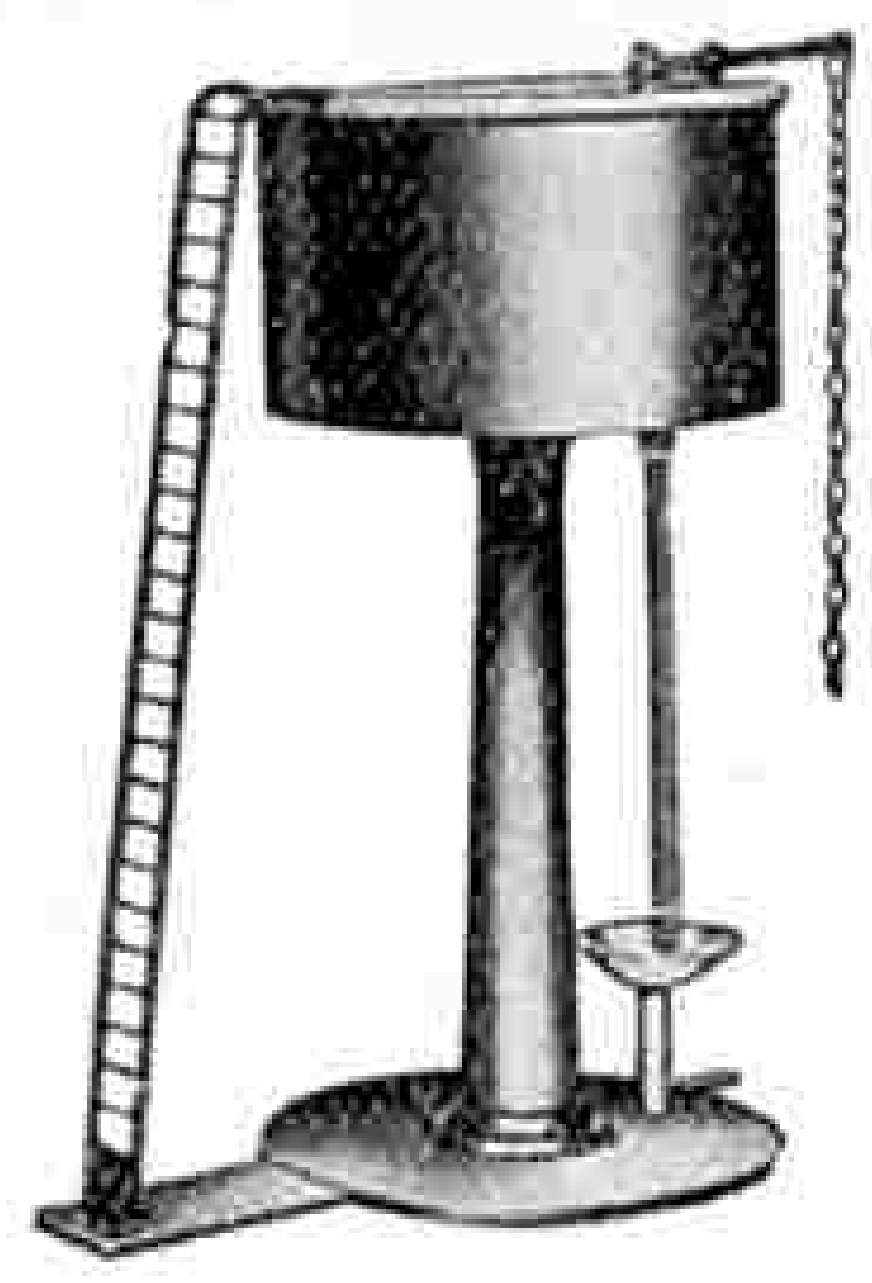

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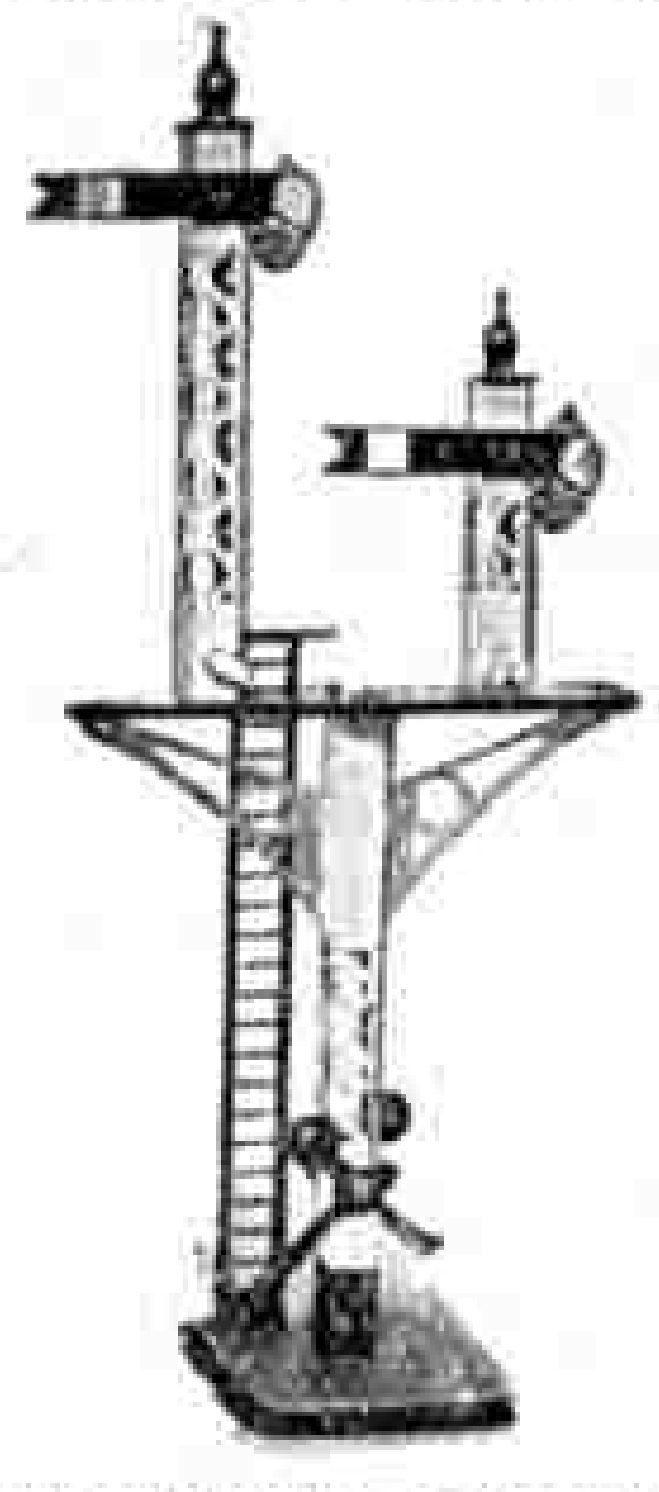

JUNCTION SIGNAL
Signal arms operated by levers at base. Very realistic model standing 14-in. in height.
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The New "Meccano" Jersey

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22"	24"	26"	28"	30" Chest
7/-	7/9	8/6	9/3	10/-

Colours :—Navy body with Light and Dark Saxe dice effect.
Mid Grey body with Black and White ,,
Fawn body with Brown and Saxe ,,
Brown body with Fawn and Red ,,
Saxe body with Navy and Dark Saxe ,,
French Grey body with Lt. and Dk. Saxe ,,

Three-quarter Hose, Turnover Tops to match

3, 4	5, 6, 7	8, 9, 10
2/9	3/3	3/9

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The New "Meccano" Jersey

Competition Page

"Limericks"

After the overwhelming popularity of the "Limerick" competition that was announced in our January issue, it is very unlikely that any introduction to the subject of this month's contest is necessary, but for the benefit of new readers who have not come in contact with this peculiarly humorous type of poetry before, we append an example in order that they may appreciate fully the characteristic rhythm.

A rooster once said to his hen,
I've told you again and again,
That to bring a good figure,
Your eggs must be bigger,
So try models 8, 9 and 10.

Another example appears on this month's Fireside Fun page as "This month's short story."

In this contest, however, we are imposing one restriction. The final word of the first, second and last lines must be made up by rhyming words pronounced differently from their spelling, as for example the following :—

A nice little lady named Cholmondeley,
Was noticed to look rather glolmondeley,
When asked : "Why so sad ?"
She replied : "It's too bad,
I'm not the least little bit colmondeley."

The clue to the strange rhyme is that the word Cholmondeley, an old English name, is pronounced "Chumley."

A further example demonstrating the use of words other than proper names will perhaps illustrate the requirements of the contest even more quickly than paragraphs of explanatory matter :—

A wise old lady of Slough,
Once owned a remarkable cough,
It let forth a neigh
When feeding on heigh,
So she harnessed that cough to a plough !

The combinations possible in this form of Limerick are of endless variety and will provide a good test of our readers' ingenuity. Competitors may submit as many entries as they wish but each must be written upon a separate post card, which also must bear the name and address of the entrant. Entries must be addressed to "Limericks," Meccano Magazine, Binns Road, Liverpool.

Prizes of Meccano goods to the value of 15/–, 10/6 and 5/– will be awarded to the three best entries submitted and consolation prizes, value 2/6 each to the next eight competitors. Closing date, 30th October. Overseas, 31st January, 1927.

18th Drawing Contest

After a lapse of a few months we return to the type of drawing subject that has proved so popular with our readers, transport, and the subject of this month's contest will be "A Racing Motor Car." In recent issues there have appeared various photographs of racing automobiles and these will serve as a guide to the less fortunate readers who have never had the privilege of watching a motor race. Of all forms of sport on land this is the most thrilling. Speeds exceeding 120 miles per hour (over fifty yards per second) are commonplace and the marvel of such powerful machinery should serve as a stimulant to competitors' imaginations.

Competitors will be divided, as usual, into two groups, A, those aged 16 and over, and B, those under 16. Prizes of artists' materials or Meccano goods (to be chosen by the winners) to the value of 10/6 and 5/– respectively will be awarded to the first and second prize winners in each section, in addition to a number of consolation prizes of the value of 2/6. Each entry must bear the name, age, and address of the competitor and should be forwarded to "18th Drawing Contest," Meccano Magazine, Binns Road, Liverpool. Closing date, 30th October. Overseas, 31st January, 1927.

October Essay

That some of our beautifully coloured front covers are more popular than others is a point that is made known to us by the varying quantity of complimentary comments that reach us from our readers, but why readers like certain covers more than others is a matter of considerable interest. Accordingly we have decided to set as the subject of this month's essay contest "My Favourite Cover and Why I Prefer It." The subject is too straightforward to require discussion.

There will be two sections—A, for readers of 16 and over, and B for those under 16 and prizes of Meccano Goods to the value of £1/1/– and 10/6 respectively will be awarded to the best and second best entries in each section. Entries must be written on one side of the paper only and should be addressed to "Covers Essay." Closing date, 30th October. Overseas, 31st January, 1927.

Overseas Result

April Sharp Eyes Contest

The entry for the third of this "mistakes" series was much greater than for either of the previous contests and it was not surprising therefore to find keen competition for the prizes. Many boys included many errors that were possible only in the light of the conditions in their own countries but, as in previous contests, where it was clear that the point specified actually was at variance with ordinary railway practice in the competitor's country, he was accorded the benefit of the claim.

At first sight such a method of judging would appear to confer an advantage to competitors resident in some countries, but particular care has been taken to ensure that this difficulty did not vitally affect the awards which are given to the following : 1. B. Gravener (Sydney, N.S.W.) ; 2. H. W. Turner (Hastings, N.Z.) ; 3. B. Whyte (Hastings, N.Z.) ; 4. R. Drew (Thagoona, Sydney, N.S.W.)

Competition Closing Dates :

HOME	
Limerick Competition	**30th October**
18th Drawing Contest	**30th October**
October Essay	**30th October**
OVERSEAS	
From My Window Essay	**30th October**
15th Drawing	**30th October**
27th Photographic	**30th October**
Summer Pastimes Voting	**30th November**
County Cricket v. League Cricket	**30th November**
16th Drawing Contest	**30th November**
28th Photographic	**30th November**
Where is our Artist Right ?	**31st December**
17th Drawing	**31st December**
29th Photographic	**31st December**
Doublets	**31st December**
September Essay	**31st December**
30th Photographic	**31st December**
Limericks	**31st January**
18th Drawing	**31st January**
October Essay	**31st January**

Watch the Closing Dates :

Competitors, both Home and Overseas, are particularly requested to make a careful note of the closing dates of any competitions for which they intend to enter. Week by week we receive entries for various competitions that have been closed for some time. Some of these entries are excellent and it is a pity for competitors' good work to be wasted on account of losing sight of the closing date.

Results

Cricket Forecasting Contest

The keenness of our readers' interest in cricket was amply demonstrated by the large entry for this contest and by the fact that 61 competitors succeeded in giving the names of the first six counties. Fortunately the correct order had to be given and no one succeeded in doing this. As will be known to all by now the eventual result of the cricket championship was another triumph for the "big six" of county cricket, the actual order being Lancashire, Yorkshire, Kent, Nottinghamshire, Surrey, Middlesex.

Only one competitor of the first 61 was sufficiently impressed by the Lancashire team to award it pride of place on its merits up to June. The majority of the remainder gave Yorkshire, which county figures at the head of 99 of every 100 entries. The prizes were awarded as follows :—1. K. Smith (Derby) ; 2. J. M. Birkin (Nottingham) ; 3. F. Broxton (Wellington, Salop) ; 4. H. Adams (Addingham, Yorks.)

Consolation Prizes were awarded to L. Dodson (Cobham, Surrey) ; D. Gilbert (Edinburgh) ; T. H. Horsburgh (Eastbourne) ; N. Ward (Halifax).

Where is our Artist Right?

Competitors generally entered into the spirit of this contest and one can readily imagine the chuckles that obviously must have served as an accompaniment to the preparation of some of the lists. Many of the claims were distinctly ingenious but probably the best "shot" of the whole set was "The Meccano Boy is Smiling."

The prizes were awarded to :—1. R. Warren (Wolverhampton) ; 2. S. Nicholls (Whitstable) ; 3. D. Elson (Falmouth) ; 4. J. Mason (Leicester).

17th Drawing Contest

The prizes were awarded as follows :—First Prizes : Section A, Miss B. Wardlaw (Sherborne) ; Section B, H. Davies (Bristol). Second Prizes : Section A, W. J. Glenn (Ipswich) ; Section B, T. K. Valentine, (Bedford).

29th Photo Contest

Several extremely fine sets of pictures were submitted to this contest and the prizes eventually were awarded as follows :—First Prizes : Section A, H. H. Strange (London, N.11) ; Section B, R. Sunter (Nelson). Second Prizes : Section A, T. M. Hinton (Newcastle-on-Tyne) ; Section B, N. Crossley (Stockport).

In the alternative section the following were the successful competitors :—First Prizes : Section A, S. E. Morris (Cardiff) ; Section B, B. Simon (Manchester). Second Prizes : Section A, L. E. Horgan (Birmingham) ; Section B, Miss M. Chapman (Manchester).

The Secretary's Notes

The New Session

Now that October is here and holidays fading into a pleasant memory, Club Leaders and secretaries are full of plans and schemes for the advancement of their Clubs during the new session, and for the interest and entertainment of the members who will return to the prospect of cosy Club-room nights more enthusiastically than ever. Every day requests are reaching Headquarters for advice and information on various club matters, and for reinforcements of club literature. It is impossible to over-emphasise the importance of every secretary having good stocks for the session. Each member requires a new Membership Card and one of the special Subscription Cards recently introduced. The syllabus must be drawn up and placed on the club notice-board in good time. The treasurer should have all his accounts in order and his system perfected for future meetings. Last, but by no means of least importance, the secretary must have a good stock of Report Forms.

Secretaries, Beware!

This year I am going to be very strict about Club Reports, for the attention to, or neglect of, this responsibility by the secretary may eventually affect the welfare of the entire Club. Sometimes the dawn of some little trouble comes to light through reports, and with experienced advice from Headquarters the threatened danger may be avoided and obstacles satisfactorily overcome. My advice to secretaries and Leaders is to keep closely in touch with Headquarters, and to take advantage of the assistance available in the loaning of stories, lectures and models and the supply of literature of all kinds.

New Clubs

There are many new clubs launching forth on their careers this month, and they are assured of the good wishes of the entire Guild. Some of our most successful clubs may now be in the making, and boys who are embarking on club life for the first time will do well to put their very best efforts into their work for the good of the community. It is with Leaders and secretaries that the great responsibilities lie, but every individual member plays his own part in his club's career, and his attitude in its own degree can raise or lower the standing of his club. I hope that this season all members will pull together, and foster the spirit of unity and goodwill without which no club can become really great.

Girls and Meccano

"I am a Meccano girl and it is my chief delight to take my brother's Outfit and build models," writes Miss Joan Fenton of New Zealand. Joan is not the only girl who likes to purloin the family Outfit occasionally. One Meccano boy, complaining of his sister's model-building exploits, made the closing remark: "Anyway, girls always build such silly models!" I think he would change his views if he could see some of the good work turned out by girls recently. Several girl readers have entered the Magazine model-building contests, and have won Certificates of Merit and special commendation among thousands of candidates.

Girls as Club Members

Girls are finding a place in Meccano Clubs, too, and many of our most successful Clubs report excellent work by the Girls' Sections. From one South African Club Leader we hear that "the girls are outdoing the boys." A young friend of mine writes from Jersey, Channel Islands, in a most condemnatory tone regarding the enrolment of girls in Meccano Clubs. "They cannot tell the difference between a Threaded Boss and a Universal Coupling" he complains, "They know nothing about engineering, and all they know of electricity is that you just press down a switch and the light comes! I ask you, what is the use of girls knitting and looking on?" This is a drastic criticism, and it seems to prove that my young friend does not really understand the position of girls in Clubs.

A striking instance of sectional co-operation is afforded by Richmond Meccano Club. Here the Girls' Section has its own Leader and a special corner in the Club Magazine. The boys of this Club are now working on an immense model Dolls' House, which is to have electric fittings and will be provided with attractive furniture by the Fretwork Section. The Girls' Section is working on all the necessary soft furnishings, curtains, etc., and when complete this fine piece of work will be sold to benefit Club Funds. Such co-operative achievement is possible to all Clubs and is highly desirable. There is no doubt that there are many Meccano boys and girls keenly interested in this question of the advisability of Meccano for girls, and their place in Club life. I wish that it was possible to organise a great debate and hear every member's opinion. Since this is quite out of the question, however, I should like to see letters from any of my young friends interested in the subject, and any that give a new and interesting light on the topic will be quoted on this page for the benefit of all readers.

Over a Hundred Members

Harwich Meccano Club, formed at the end of 1924 and affiliated with the Guild in January 1925, is one of the most successful Clubs in the Guild.

One of the Club's most interesting features is the long list of officials. It has for its Patron His Worship the Mayor of Harwich, and for its President the Vicar of Harwich, Rev. Canon Arthur E. Mills, R.D. The Chairman of the Club is Rev. Leonard H. S. Hinder, whose devotion of time and interest to the Club has endeared him to all members. Mr. Arthur S. H. Hogg is the Leader, and in the photograph is shown a specimen of his art in the "Deputy Certificate" included in place of the official Affiliation Certificate, which was being re-framed at the time that photograph was taken. The certificate painted by Mr. Hogg is a handsome piece of work of which the members are justly proud.

Two sub-Leaders governing various sections of the Club are Messrs. C. Jeffries and E. Pratchett, and its keen and enterprising Secretary is Mr. A. E. W. Ward. When the last report was received from this Club, the membership was 101, and the syllabus is an unusually advanced and varied one, comprising Raffia Work, Fretwork, Toy Soldier Making, Carpentry, Electricity and Wireless.

CLUB NOTES

St. George's (West Ham) M.C.—A very successful Exhibition was held recently. A good display of models included a Derricking Crane loaned from Headquarters. A refreshment stall was well patronised and a guessing competition proved very popular. As usual, the secretary and some members of Christ Church M.C. attended and helped to make the function a success, and the parents of several members rendered valuable assistance. Club roll: 20. Leader: Mr. A. J. Wilcox, 103, Durban Road, West Ham, London, E.15.

Rhos-on-Sea M.C.—Recently held its Annual Athletic Sports. The members are divided into "Nuts," "Bolts" and "Washers," and the various sports items were keenly contested by the three "houses." The "Bolts" gained the day by winning the greatest number of points. Indoor meetings are being recommenced this month. Club roll: 26. *Secretary*: G. E. Mellor, Bradda, Allanson Road, Rhos-on-Sea, Colwyn Bay.

Collegiate Schools (London) M.C.—An Exhibition and Fete was recently held and proved an unqualified success. The opening ceremony was performed by the President, Mr. J. Temblett-Wood, whose address aroused great enthusiasm. There was a fine display of models, thirty-seven being entered for the Competition. A Model Railway comprising about 200 yards of track was working throughout the afternoon. Various attractive sideshows were conducted, including a Rifle Range, "Aunt Sally," and many others. Clown "Beppo" delighted everyone, and Professor Rowlands, the palmist, was well patronised. A lecture on Petrol Engines by Mr. Booker was well received, and Mr. Denington Palmer's address in connection with the Meccano Guild and the club received a great ovation. Club roll: 37. *Secretary*: W. R. Wright, 8, Derwent Road, Palmers Green, London.

St. Mary (Newington) M.C.—A good programme has been arranged for the Winter months, after the temporary closing down of the club during the holiday season. An Exhibition is arranged to take place in November and the members are busily preparing for it. *Secretary*: Mr. C. A. E. Curle, 37, Pullen Flats, Peacock Street, London, S.E.11.

Weston M.C.—A "Treasure Hunt" was recently organised, over a course of four miles, and everyone was pleased when the youngest member of the club captured the "Treasure." An excursion to Brean Down proved most enjoyable. The party went by motor boat, and tea at the Fort was followed by a good game of rounders. Another successful outing was a charabanc party to Cheddar, where the members saw the famous caves and gorge and spent an interesting hour in exploring. A committee has been formed to discuss future arrangements. Club roll: 22. *Secretary*: R. B. Nichols, 3a, Royal Parade, Weston-Super-Mare.

Middlesbrough M.C.—The club Magazine is very popular and quite a good number of copies are sold. A recent issue included a feature entitled "What to do at the Seaside," to which various members contributed. Several of the prescriptions for a good time at the seaside were very amusing. An Exhibition and a Concert are included in the plans for the Winter Session. Club roll: 44. *Secretary*: A. Bradley, 23, Laurel Street, Middlesbrough.

Bures M.C.—Several models were constructed and incorporated in an Exhibition at the Bures Fete. They included a Tower Bridge, Telpher Line, Eiffel Tower, Motor Bus and many others, and a Hornby Train display was also arranged. The Meccano Tent was well patronised and helped the Fete considerably. Club roll: 18. *Secretary*: J. Dessent, "Queen's Head," Bures.

Haslingden Secondary School M.C.—Meetings have been suspended for some time owing to school holidays and a new syllabus is being arranged for the Winter. The club has lost its enthusiastic secretary Grenville D. Yarnold, who is leaving the school, but who has been made an honorary member in view of his past good work for the club. K. Tupling, who capably filled the position of secretary prior to G. D. Yarnold's election, has been re-appointed. Club roll: 30. *Secretary*: Kenneth G. Tupling, 16, Alexandra Terrace, Haslingden, Manchester.

St. Annes (Bristol) M.C.—Picnics, Paper Chases, Games Evenings and several successful Cricket Matches have been included in recent activities. A "Flannel Dance" was well attended and greatly enjoyed, a good profit being realised, and another is to be held shortly. A Building Fund has been commenced to raise money for the building of a club hut in which to hold meetings. Club roll: 25. *Secretary*: J. Davis, 45, Arlington Road, St. Annes Park, Bristol.

Great Baddow M.C.—A successful Winter Session is anticipated. Members are preparing a special display of models for a Visitors' Night, which is a regular feature of the syllabus. Lectures on engineering subjects are being arranged. Club roll: 23. Leader: Mr. J. Pitts, "Hills Chantry," Great Baddow, Chelmsford.

Stockton-on-Tees M.C.—An Exhibition is arranged for next month and the members are busily preparing models. The display will include a special model loaned from Headquarters. *Secretary*: N. Middleton, 74, Victoria Avenue, Norton Road, Stockton.

Bearwood M.C.—Has now recommenced activities with a great Recruiting Month. The syllabus includes Meccano and Hornby Nights, Special Games' Evenings, Lantern and other Lectures, a Prize Night, Competition Night and an Exhibition. A club Advertising Month is also being discussed and Visitors' Nights may be introduced. Club roll: 40. *Secretary*: C. White, 72, Katherine Road, Bearwood, Birmingham.

Pitsea and District M.C.—Has been closed down owing mainly to the departure of the Leader for Malay, and the unavoidable resignation of the secretary. The financial position of the club is sound and a new club room is assured. The support of local Meccano boys is invited and they should write to Frank E. King, High Road, Pitsea, Essex.

Meccano Club Leaders

No. 29. Mr. A. E. Moore

Our photograph shows Mr. A. E. Moore of Eastbourne, Leader of Meads Meccano Club.

Meads M.C. is one of our oldest Clubs, having been affiliated in February 1921, and since affiliation it has progressed steadily, an interesting syllabus including Lectures, Model-building Competitions, Concerts and Social Evenings being maintained. It was recently found necessary to suspend activities temporarily, as a new hall is in course of construction which will be available for use as a Club-room.

Mr. Moore expects to re-commence activities in the near future, and it is confidently anticipated that the Club will soon regain its former strong position.

Australia

Glenelg M.C.—An interesting "Aeroplane Evening" was recently organised, each member bringing an aeroplane model of his own construction. The prize for the best model was presented to Clarence Woolands. After the judging of the models the Leader delivered an appropriate lecture, the subject of which was "The Conquest of the Air." The monthly Model-building Competitions are keenly contested, and some excellent work was displayed on the "Motor Cycle" evening. Mr. Rosenvere delivered an interesting lecture on "Canals," subsequently offering a prize for the best essay on the subject. Many visitors attended a special "Hornby Train Night," when three complete layouts were provided. Club roll: 50. *Secretary*: Keith Holmesby, 91, Partridge Street, Glenelg, South Australia.

South Africa

Malvern Wesleyan M.C.—Recent activities include the Fourth Annual Sports, described as the most successful sports the club has ever held, Games evenings, Leader's Social (at which 19 members and 57 friends were present) and Question Nights. A splendid concert was held some little time ago, the varied programme including a series of tableaux entitled "The Life Story of Meccano." By the time the concert commenced only standing room was obtainable. Club roll: 20. Leader: Mr. E. Sykes, Box 54, Cleveland, Johannesburg.

Simonstown M.C.—The excellent work of the Girls' Section is specially commended, and this is to be displayed on the occasion of an Exhibition arranged to take place at Cape Town shortly. Some fine models have been constructed in the Boy's Section, including a Giant Block-setting Crane. The club now has the honour of the patronage of the Mayor, Captain Casewell. Club roll: 45. *Secretary*: Wm. L. Creasey, Elsinore, Simonstown, South Africa.

Italy

Siena M.C.—Cricket and Model-building are the main activities, prizes being awarded for the best models. Merit Medallions have been awarded to Piero Pignotti and Cesare Lunghetti, the former having worked very well throughout the session and the latter having delivered a good lecture. Activities have been temporarily suspended during the holiday season. Club roll: 7. *Secretary*: Valentino Bruchi, 39, Via Ricasoli, Siena, Italy.

Clubs not yet Affiliated

Ossett and District M.C.—After a temporary cessation of activities this club has been received under the Leadership of Mr. Crowther, and a successful Winter session is anticipated. Intending members will receive a hearty welcome. Club roll: 16. *Secretary*: A. Spencer, 13, Westfield Street, Ossett.

Niton (Isle of Wight) M.C.—Although an adult Leader has not yet been obtained, the members meet regularly for model-building and discussions on various subjects connected with the hobby. New members should communicate with the *Secretary*: H. J. King, Rookley Cottage, Niton, Isle of Wight.

Waverley (Australia) M.C.—Sound progress is reported. A meeting is held every Monday evening under an adult Leader, and it is hoped that affiliation with the Guild will be effected in the near future. New members will receive a cordial welcome. *Secretary*: V. Worstead, 101, Cowper Street, Waverley, Sydney, N.S.W., Australia.

Moseley M.C.—Activities have been limited recently on account of the coal strike, and several interesting excursions that had been arranged had to be abandoned. Otherwise the club is in a satisfactory condition and there are great hopes for its advancement during the coming winter. *Secretary*: S. J. Fletcher, "Ambleside," 20, Woodlands Road, Sparkhill, Birmingham.

Wolverhampton M.C.—Promises to be a success though an adult Leader has not yet been obtained. Meccano boys in the district should get in touch with the *Secretary*: R. M. Martin, Erskine, Finchfield, Wolverhampton.

Stotfold Pioneer M.C.—Recently entered in the local hospital procession and took first prize. The procession equipment included a small boy of about five years of age, and one disguised as an old man with a white beard. They bore the famous slogan: "The Best Age To Start Meccano is Anywhere Between 5 and 70." *Secretary*: E. Ray, Stotfold House, Stotfold, Beds.

Karachi M.C.—An Exhibition recently held proved highly successful. It is hoped that affiliation will shortly be effected, and new members will receive a hearty welcome by the *Secretary*: Ismail Alavi, Mustafa Manzil, Garden Road, Karachi.

Bellahouston (Glasgow) M.C.—Has been temporarily closed down owing to the holidays but activities are to be recommenced at an early date. A visit to Glasgow subway was arranged some little time ago, and the members had the experience of sitting between the lines while two trains passed together. Afterwards the sheds where the cars are built were examined and every member was taught to drive! Glasgow Tramway Power Station was also visited and the excursion proved most interesting. *Secretary*: N. Ralph, 9, Torbeck Street, Bellahouston Glasgow.

Uttoxeter M.C.—A promising club has been formed, and boys interested are invited to join. It is hoped to incorporate an Exhibition of models in a local show, though this is not definitely decided. Club roll: 10. *Secretary*: E. H. Davies, 49, New Street, Uttoxeter.

North Wall (Dublin) M.C.—It is hoped to be holding regular meetings shortly. New members will receive a hearty welcome and should communicate with the *Secretary*: Myles Byrne, 14, Newfoundland Street, North Wall, Dublin.

Brighton (S. Australia) M.C.—Under the Leadership of Mr. Patrick, Leader of Glenelg M.C., a promising club has been formed at Brighton. Meetings are held fortnightly and boys interested are invited to communicate with the *Secretary*: Don Rosevear, 5, Colton Avenue, Brighton, South Australia.

Bombay M.C.—A small club has been formed under the Presidency of Mr. H. Naik, Consulting Engineer and member of the District Board, at whose home weekly meetings are held. New members will receive a hearty welcome but only boys between the ages of 10 and 20 are eligible to join. Leader: Mr. S. V. Srinavasan, Patkar's Buildings, Khar Road, Bandra, Bombay.

Proposed Clubs

New Parkside (Australia) M.C.—An effort is being made to form a club in New Parkside, and already the help of an adult Leader is assured, the secretary's father having promised to take this position. Interested members should communicate with the *Secretary*: Colin Hickox, 12, Cambridge Terrace, New Parkside, Australia.

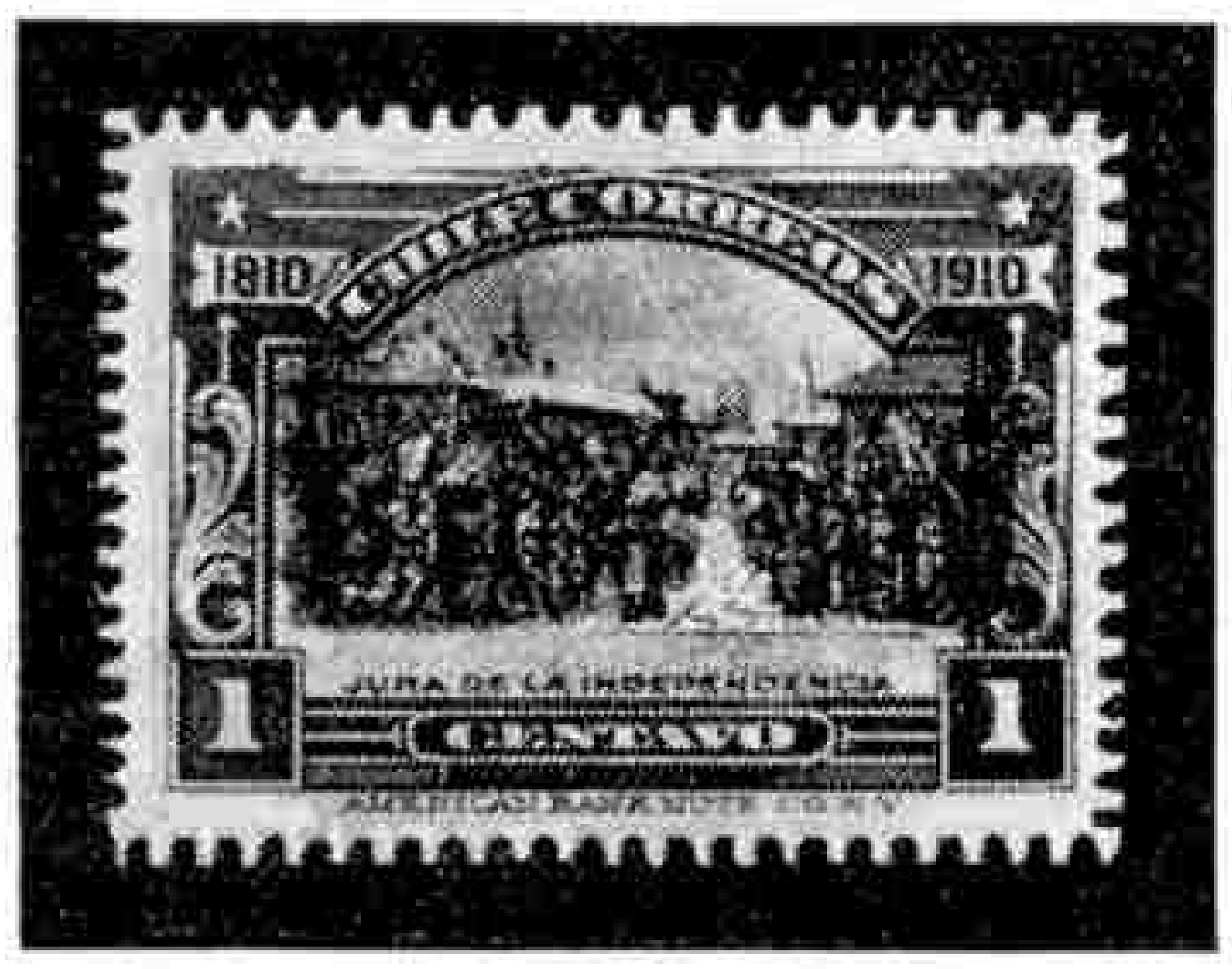
Bournemouth M.C.—It is suggested that a Club should be formed for the many Meccano boys living in Bournemouth, and inquiries and suggestions will be welcomed by the promoter of the movement, G. H. Vickers, 25, Maxwell Road, Bournemouth.

Blackheath (London) M.C.—A vigorous attempt to form a Club is being made by a group of enthusiasts and Meccano boys in the vicinity are asked to support the scheme. Inquiries should be addressed to the *Secretary*: H. W. A. Gibbons, 145, Shooters Hills Road, Blackheath, London, S.E.3.

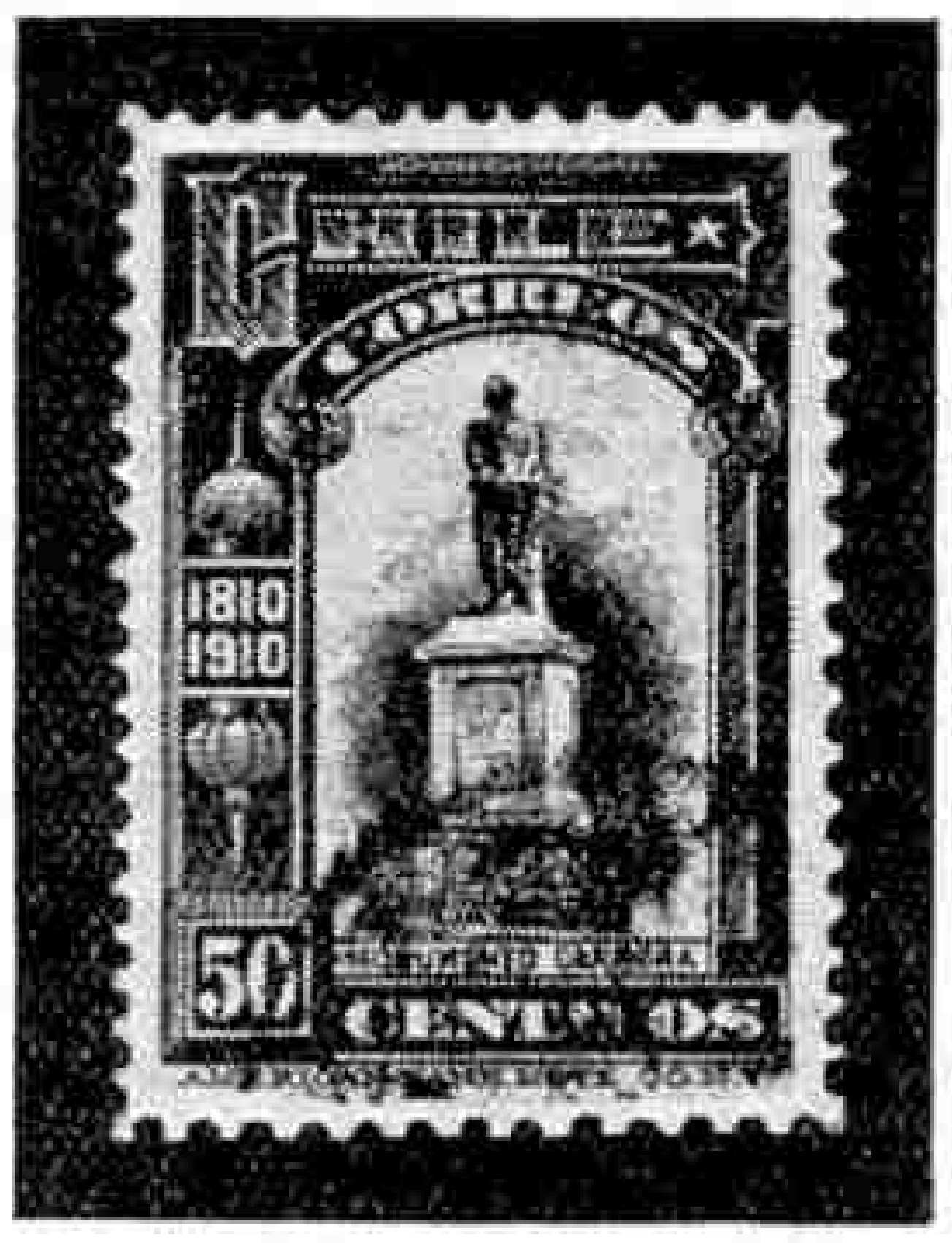
CHILI'S STRUGGLE FOR INDEPENDENCE

By R. Kay Gresswell

IN 1910, the Chilian Post Office issued a series of large-sized stamps to commemorate the centenary of the independence of Chili from Spanish rule. The series was engraved and printed by the American Bank Note Co. of New York, and was perforated 12. It makes a splendid display in any stamp album and we illustrate most of the values on this and the next page.



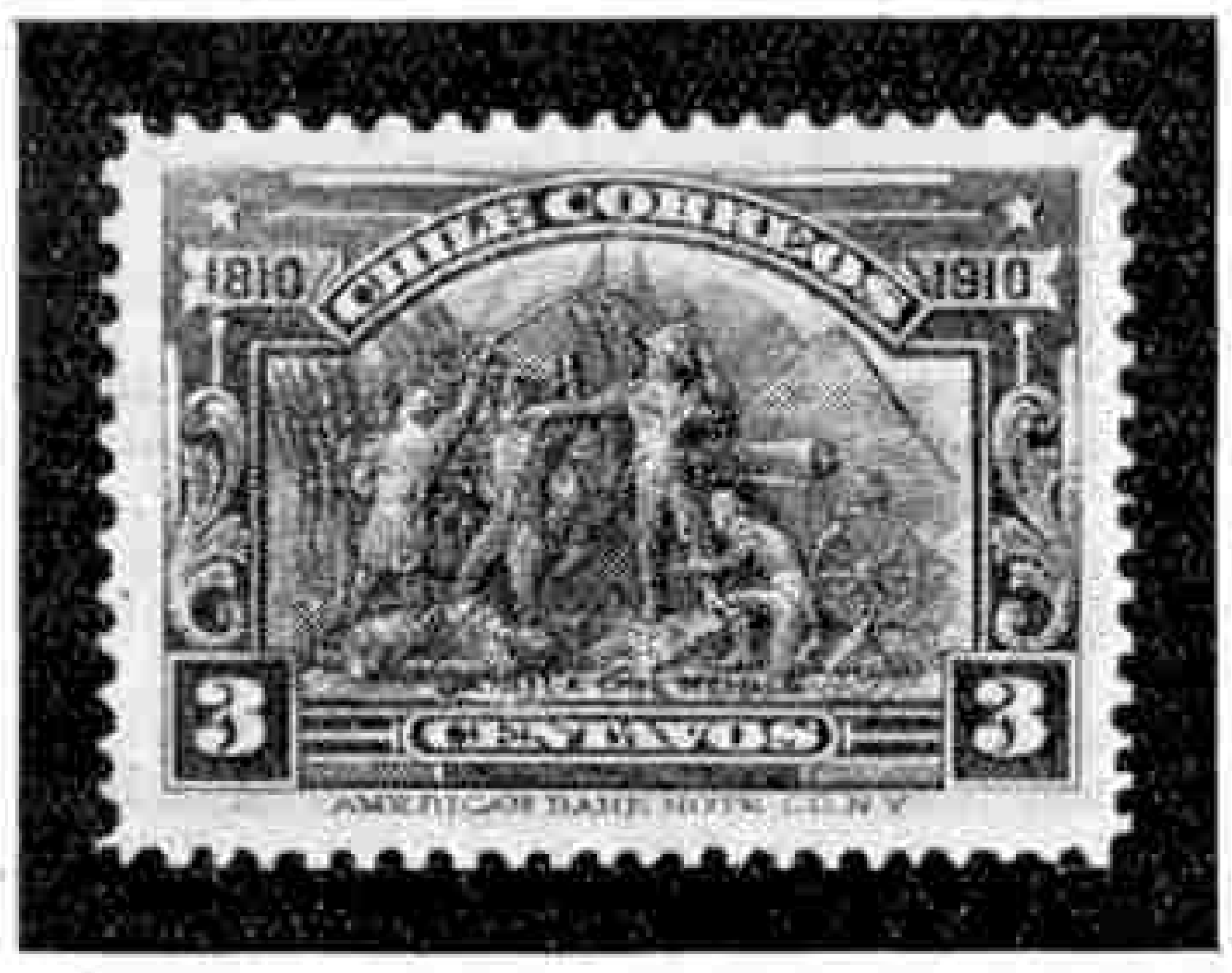
Spain made her first bid for possession of the country of Chili (whose name means "snow") in 1535 when Diego de Almagro was sent there in charge of an army with instructions to conquer the native tribes of Indians and to search for gold. He met with strong resistance and, finding little gold, returned after three years to Peru, where the Spanish were already established.



Oppressive Spanish Rule

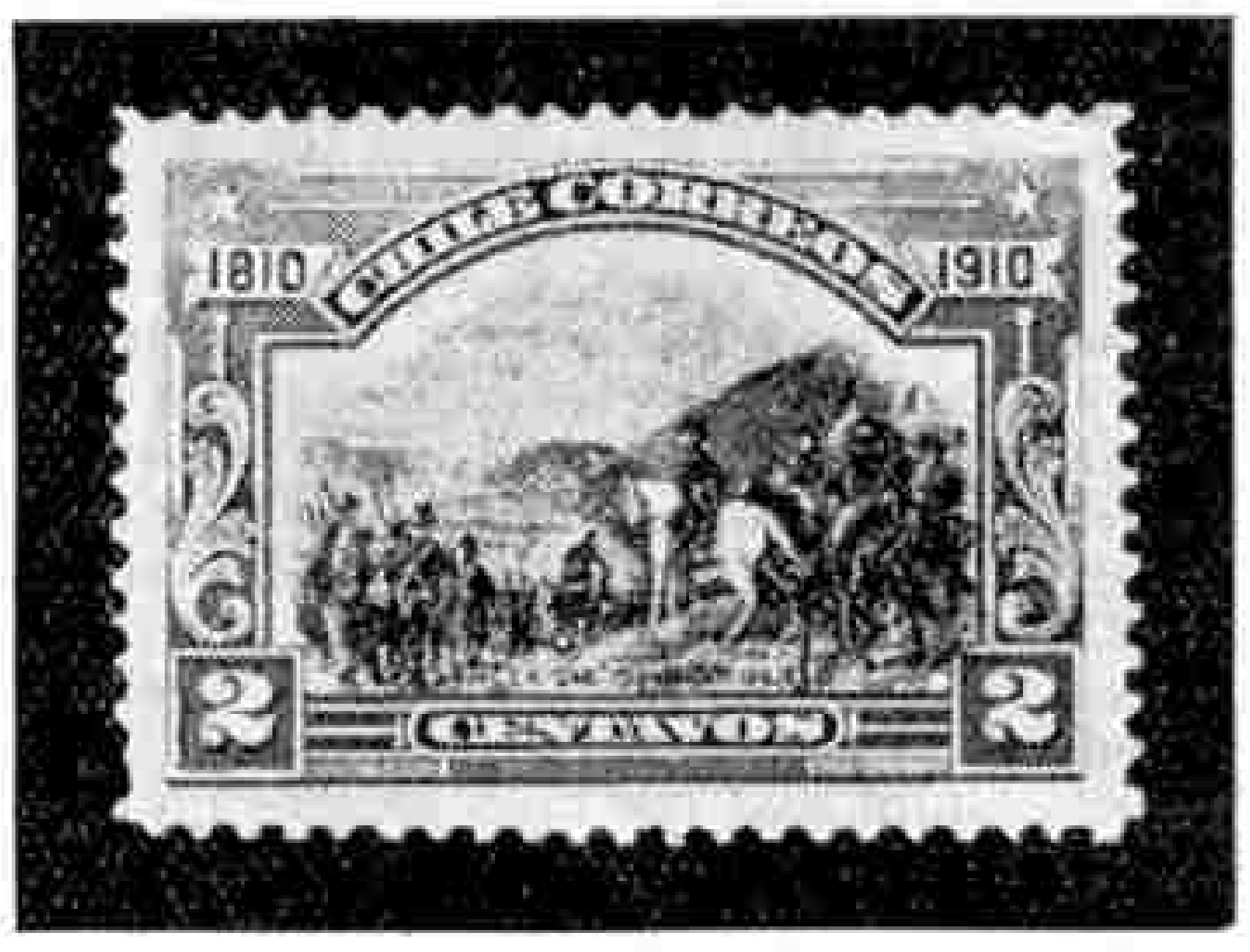
Several armies were sent in the ensuing years and it was not until 1640 that a definite peace was made. Even then the Indians, mainly represented by the Araucanian tribe, were not entirely subdued and there were three more wars before a lasting peace was made about 1800. This peace, while giving the Spaniards possession of the country, entitled the Araucanians to send a minister to Santiago, the capital.

It had been the habit of the government of Spain to put many restraints upon the behaviour of its colonies, and following out this policy during the 17th century no ships were allowed to sail to Chili round Cape Horn, no manufactures were allowed, and all the export and import trade of Chili had to pass through the one Spanish port of Cadiz.



The Spanish government became somewhat more reasonable during the 18th century and Chili was permitted the luxury of being entitled to trade with any Spanish port and even some French ones. Nevertheless certain unnecessary restrictions remained and as would be expected a considerable anti-Spanish feeling grew up.

The people began to think of rebellion and independence and they were encouraged in this by the example of the United States which had severed itself from England in 1776. Most of the other Spanish colonies in South America were in revolt in 1809, and it is not surprising therefore to find that Chili, or perhaps to be more accurate, a band of men in Chili, declared the independence of the country on the 18th of September 1810. This action is shown on the 1 centavo stamp of the 1910 issue. The governor resigned and a board of seven men was elected to take his place.

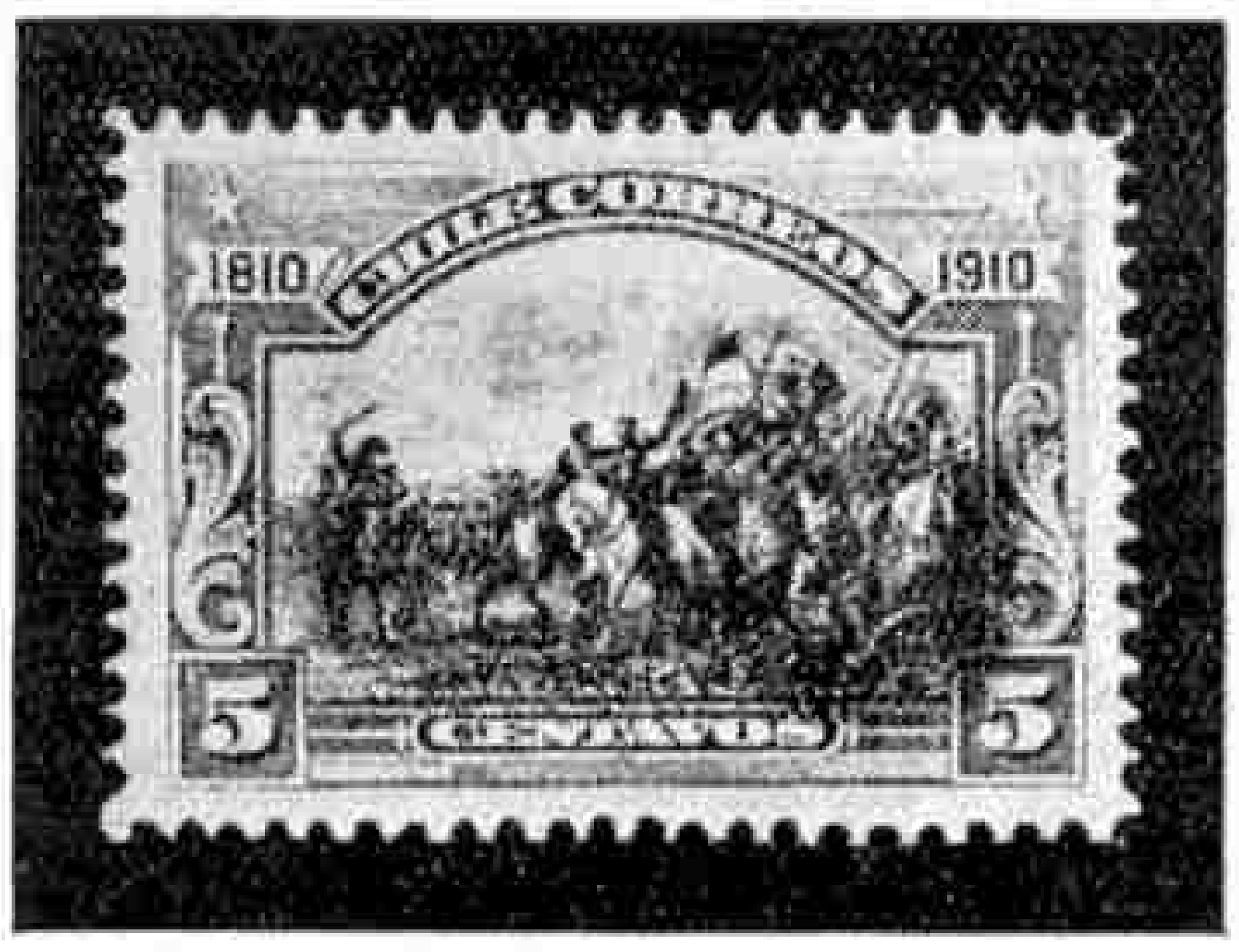


Declaration of Freedom

Merely saying that one is independent of the control of another is not sufficient, however, to secure actual independence, and it was some time before this actual independence was obtained by Chili.

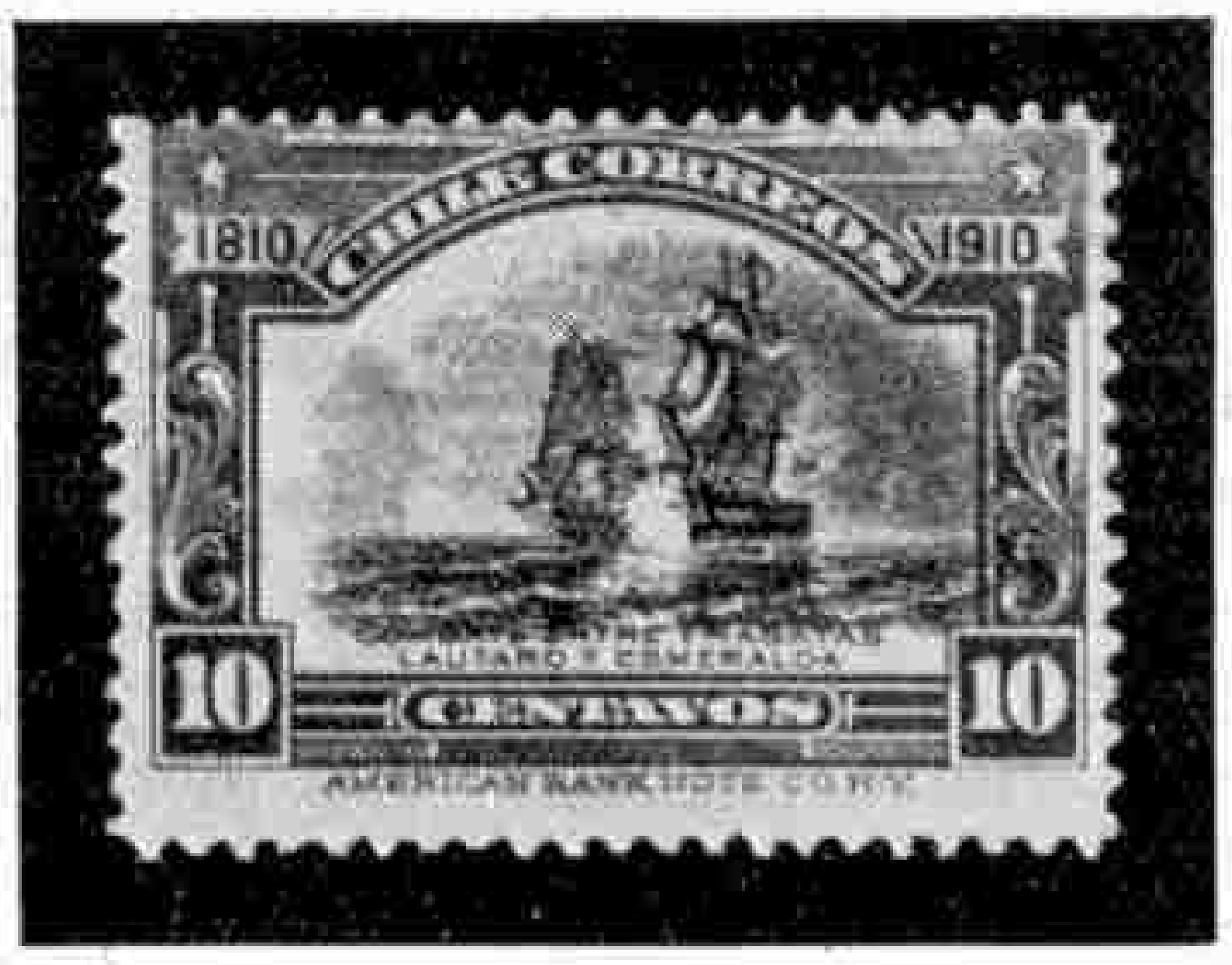
Spain was weakened and disorganised by the deposition by Napoleon of its King Ferdinand VII. and the substitution of Napoleon's brother Joseph. In spite of these internal home troubles, however, Spain was able to offer considerable resistance to this revolt, but there was the additional difficulty that it was not only Chili but most of the South American colonies that were endeavouring to secure their independence. It was mainly on account of this more or less united action that they did finally succeed in severing all connection with Spain.

The majority of people in Chili in 1810 were ignorant, uneducated and totally unable to see for themselves what political steps were necessary to rescue them from their state of suppression. Accordingly when independence was formally declared in September of that year by a band of men occupying the lower official posts in Santiago, there was considerable opposition from the people themselves.



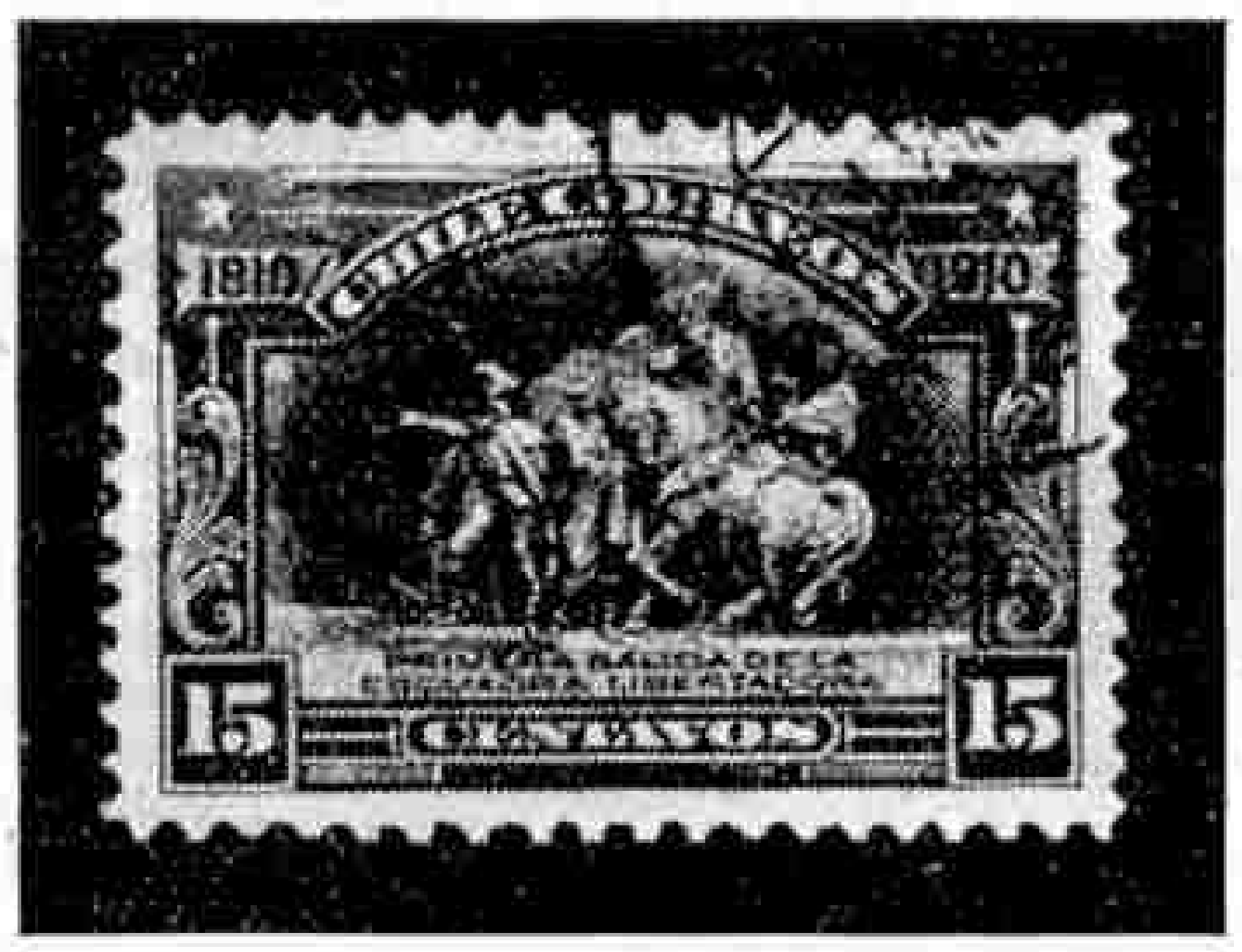
There are always people unwilling to make any great and enterprising change, for fear that the new thing obtained will be worse than the old. While this policy is often advisable yet there are times when sudden and important steps must be taken, and this was one of them.

Gradually the people became more in favour of independence, but while no longer opposed to it the majority were still not actively engaged in furthering its aims. In addition to this the leaders were by no means friendly among themselves, and accordingly the Spanish were able to retain possession of the country with the aid of a force of Spanish soldiers sent in by the viceroy of Peru. For four years indecisive fighting took place, but in 1814 the rebels were completely defeated at the battle of Rancagua, a town about forty miles south of Santiago, now on the railway from Santiago to the south.



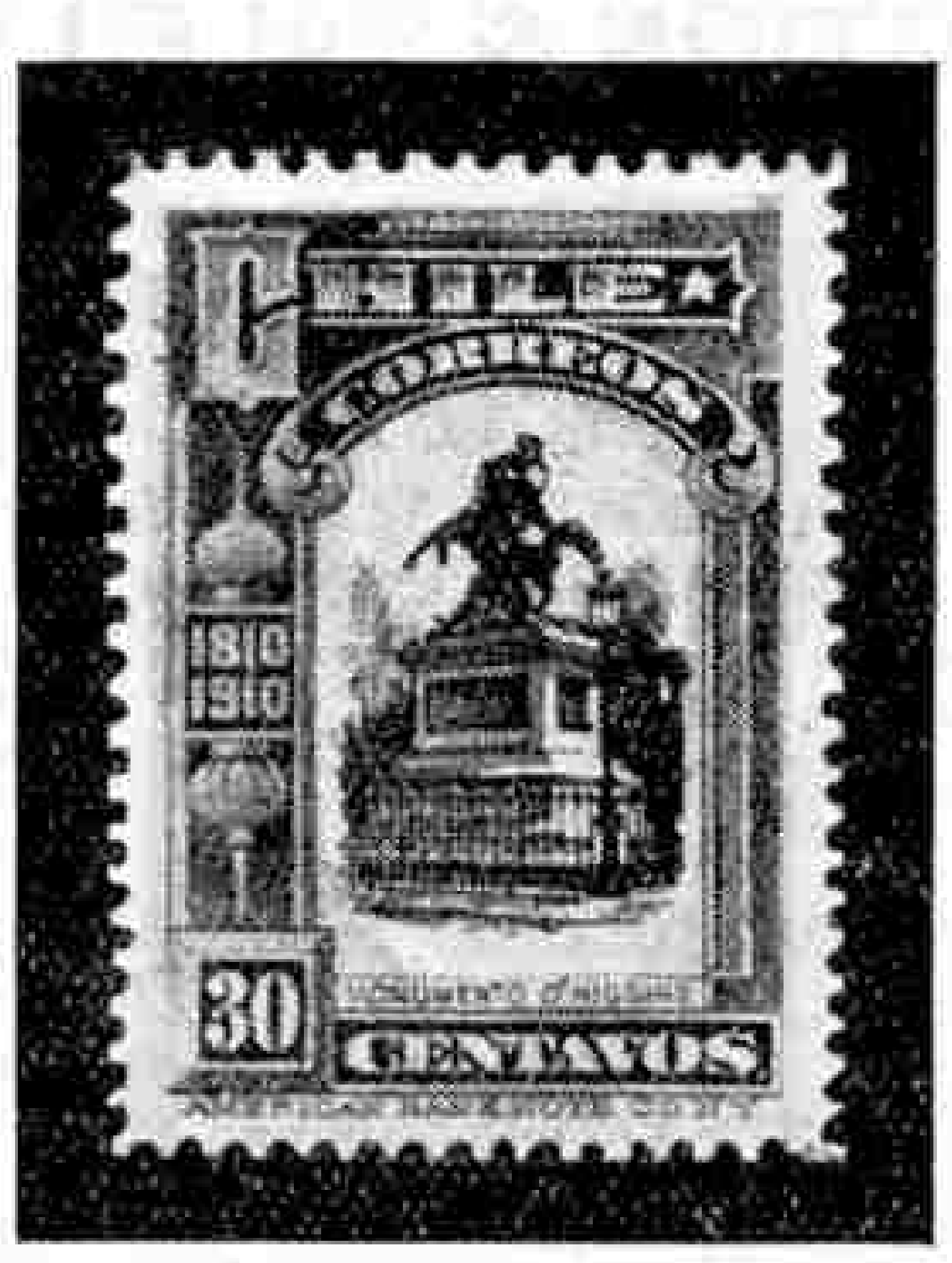
Quarrels among the Leaders

The two leaders at this time were José Miguel Carrera and Bernardo O'Higgins. Carrera, the monument to whose memory is illustrated on the 50c. value of the 1910 series of postage stamps, was born at Santiago on the 15th of October 1785. He had served in Spain in the Napoleonic war but had returned to Chili in 1811, a year after the rebellion had begun. His military experience rapidly made him prominent and he soon became the head of the nationalist government, such as it was at that time.



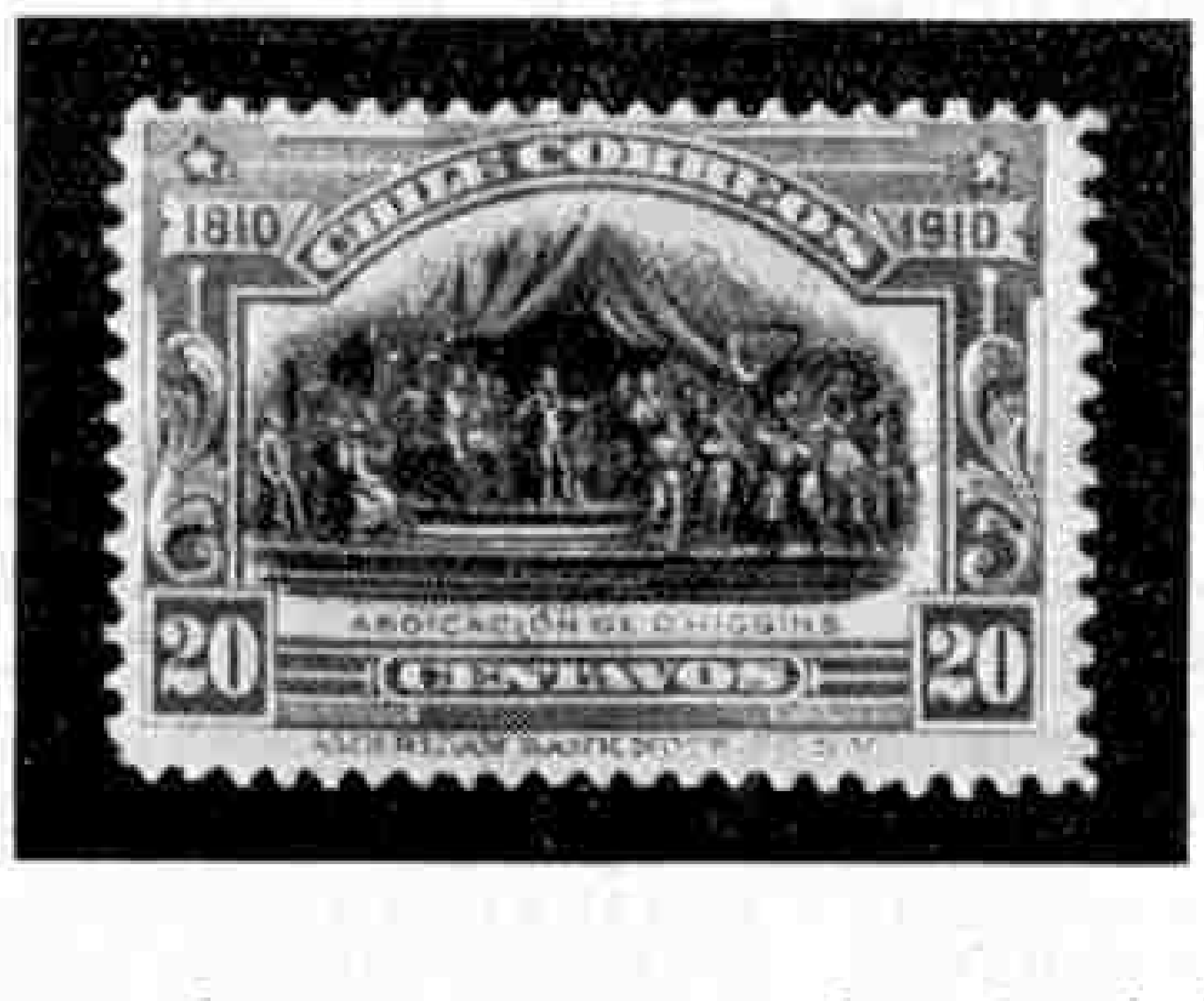
His selfish and domineering manner, however, was the cause of the quarrels already mentioned between him and the other leaders, especially O'Higgins. It was due to this that the nationalist forces were defeated in 1814. This defeat practically resulted in the dismissal of Carrera by the nationalist party, and after various adventures he was shot in the Argentine in 1821 as a result of his attempts to bring about a rebellion in that country.

O'Higgins, whose monument is shown on the 30c. value of the 1910 series, was born in Chili in 1778, his father, an Irishman, being governor of Chili from 1788 to 1796. O'Higgins was educated in England, visited Spain and then lived on his estate in Chili until 1810 when the revolution began. He became distinguished for his fighting ability with the rebel forces and was in command at their defeat at Rancagua.



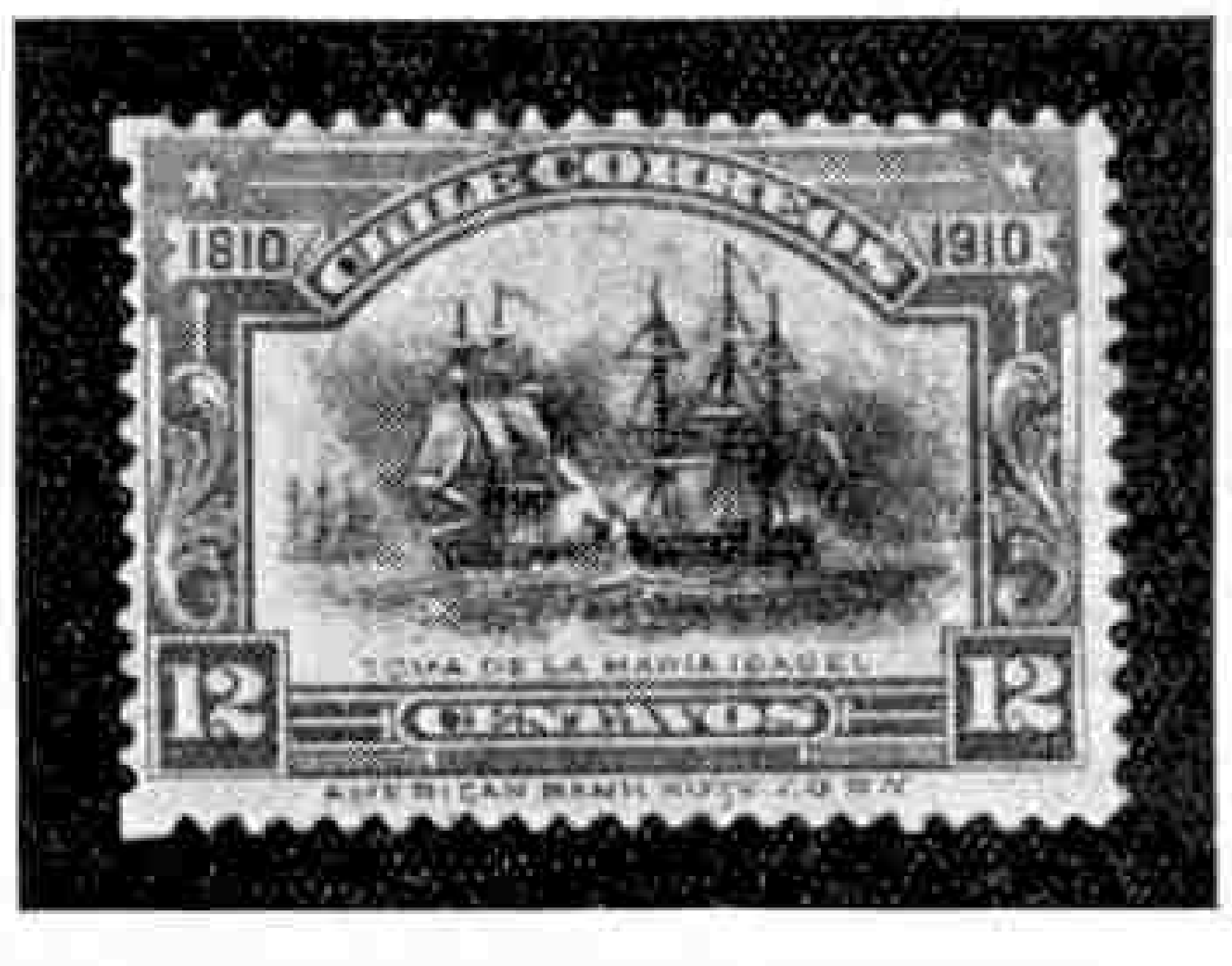
General José De San Martin

After this defeat he and most of the other leaders fled across the Andes to Mendoza where José de San Martin was preparing to enter Chili with a liberating force.



San Martin, one of the men who played a very important part in obtaining the independence from Spain of many South American countries, was born in 1778 and died at Boulogne, France, in 1850. His memory was perpetuated in Chili by the erection of a monument showing him on horseback and this is illustrated on the one peso value of the 1910 series of stamps.

He was trained for a military career and, like Carrera, served in Spain in the struggle against Napoleon. He also served under the Argentine government and assisted in securing the independence of that country. In 1814 he was put in command of the rebel army in Peru, but soon he resigned this post and stationed himself at Mendoza, near the Andes, where O'Higgins and his supporters joined him after the defeat at Rancagua.



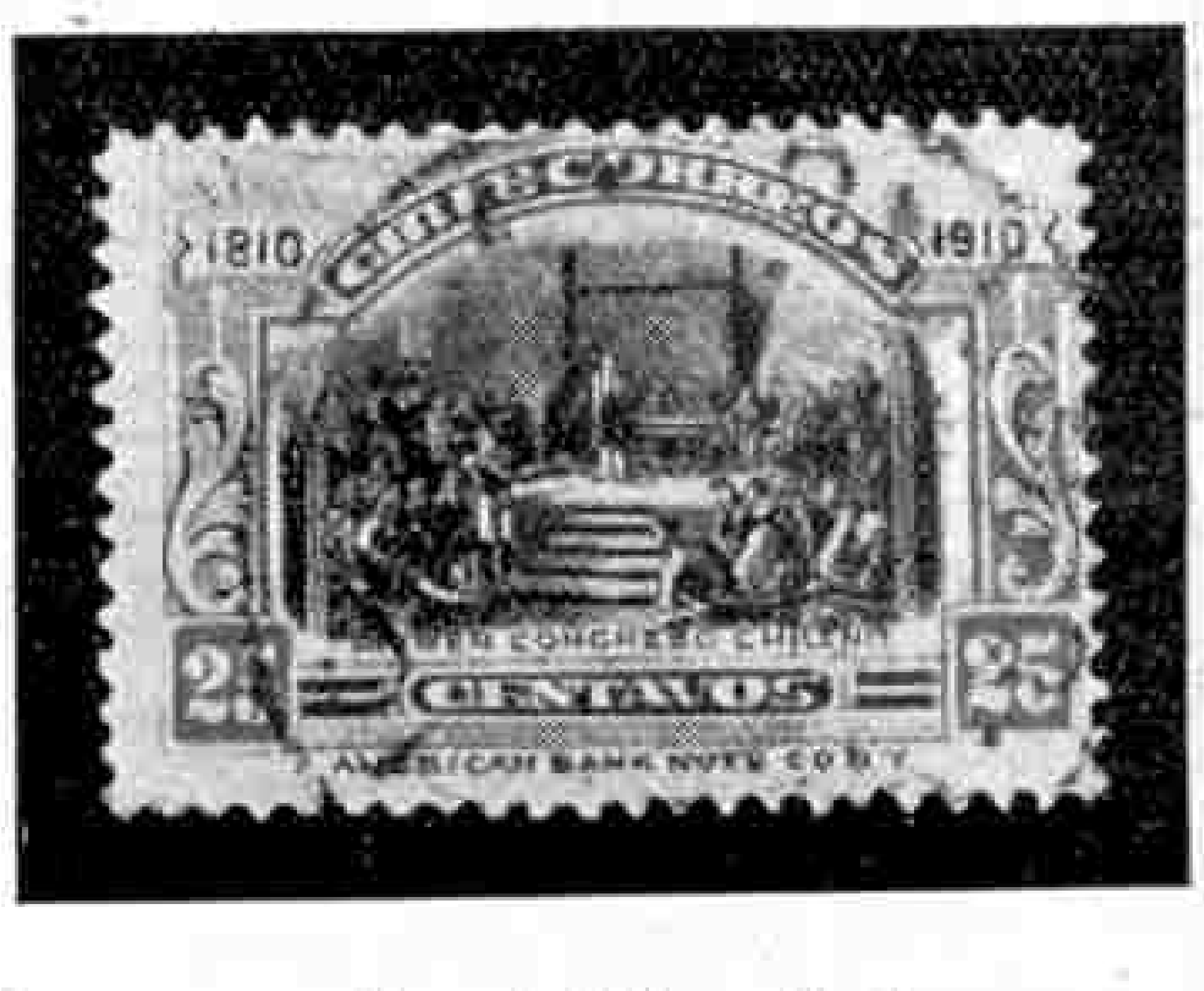
San Martin had come to the conclusion that to secure the independence of South America from Spain it was first necessary to free Chili and then to attack the Spanish forces in Peru from the south. It was for this reason that he had resigned his command in Peru and gone to Mendoza.

For a little over two years O'Higgins and San Martin were preparing a force to march across the Andes and free Chili from the Spaniards, who were now ruling the country with great harshness. In January 1817, with San Martin in command, the liberating forces set out (see the 15 centavos stamp) and the army of about four thousand men, a thousand horses, together with large baggage trains and much artillery was transported across the Andes over passes 13,000 feet in height.

On the 12th of February a great victory was obtained over the Spanish at Chacabuco (see the 2 centavos stamp), and the independent government was re-established with O'Higgins in charge. San Martin now prepared for his onslaught on Peru, but Chili's independence was not yet secure. On the 3rd of April 1818, another battle was fought and San Martin won a great victory at the river Maipo (5c. value) and by this secured the final independence of Chili.

O'Higgins continued to rule the country with great success. He maintained a close connection with the Argentine government and did what the circumstances permitted for the well-being and prosperity of the people.

San Martin had now gone to Peru and ultimately secured its independence. This removed all danger of future attacks by Spain on Chili and that country accordingly began to take steps to form a settled government with a definite constitution. O'Higgins at first attempted to retain his autocratic powers but seeing that the people were against it and that he would have to hold his office by force, he had the greatness to resign without appealing to arms (20c. value), this taking place on the 28th of January 1823. He retired to Peru and lived quietly till his death in 1842.



(*Continued on page* 643)

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Stamp Collecting—*(continued from page 641)*

In addition to showing the monuments and events that already have been described, the 1910 commemorative series of stamps shows the following views. On the 3 centavos, the Battle of Roble; on the 10c., the fight between the frigates "*Lautaro*" and "*Esmeralda,*" of which the former was named after a town of the same name in south Chili that was one of the Spanish outposts in the early struggle with the Araucanian Indians; on the 12c., the capture of the vessel "*Maria Isabella*"; on the 25c., the meeting of the first Chilian Congress, this being after O'Higgins' resignation; on the 2 pesos, a portrait of General Blanco; on the 5 pesos, a portrait of General Zenteno; and on the 10 pesos, a portrait of Admiral Cochrane, who was in charge of the first Chilian fleet.

This story of the events that took place in securing Chili's independence shows rather strikingly the importance of united and well-planned action. In spite of the fact that all the South American colonies were in revolt, because they were not acting in conjunction and also because of the lack of internal unity in the case of Chili's leaders, the rebels were defeated at the battle of Rancagua.

When, however, San Martin took command, made a definite plan for the liberation of the whole continent and spent several years in preparing for this carefully thought-out plan, a decisive success was secured with no setbacks of any kind.

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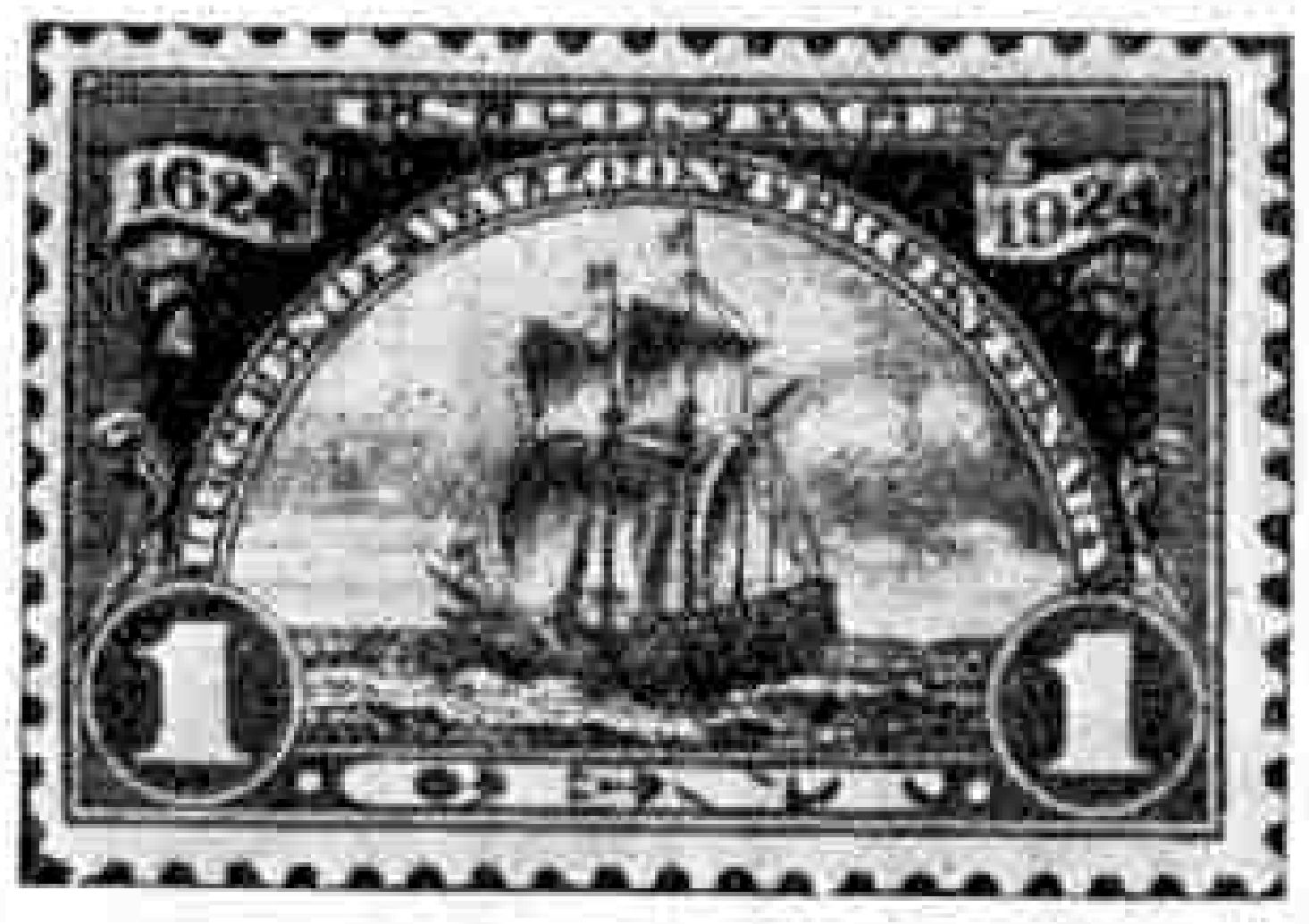
Recent Issues

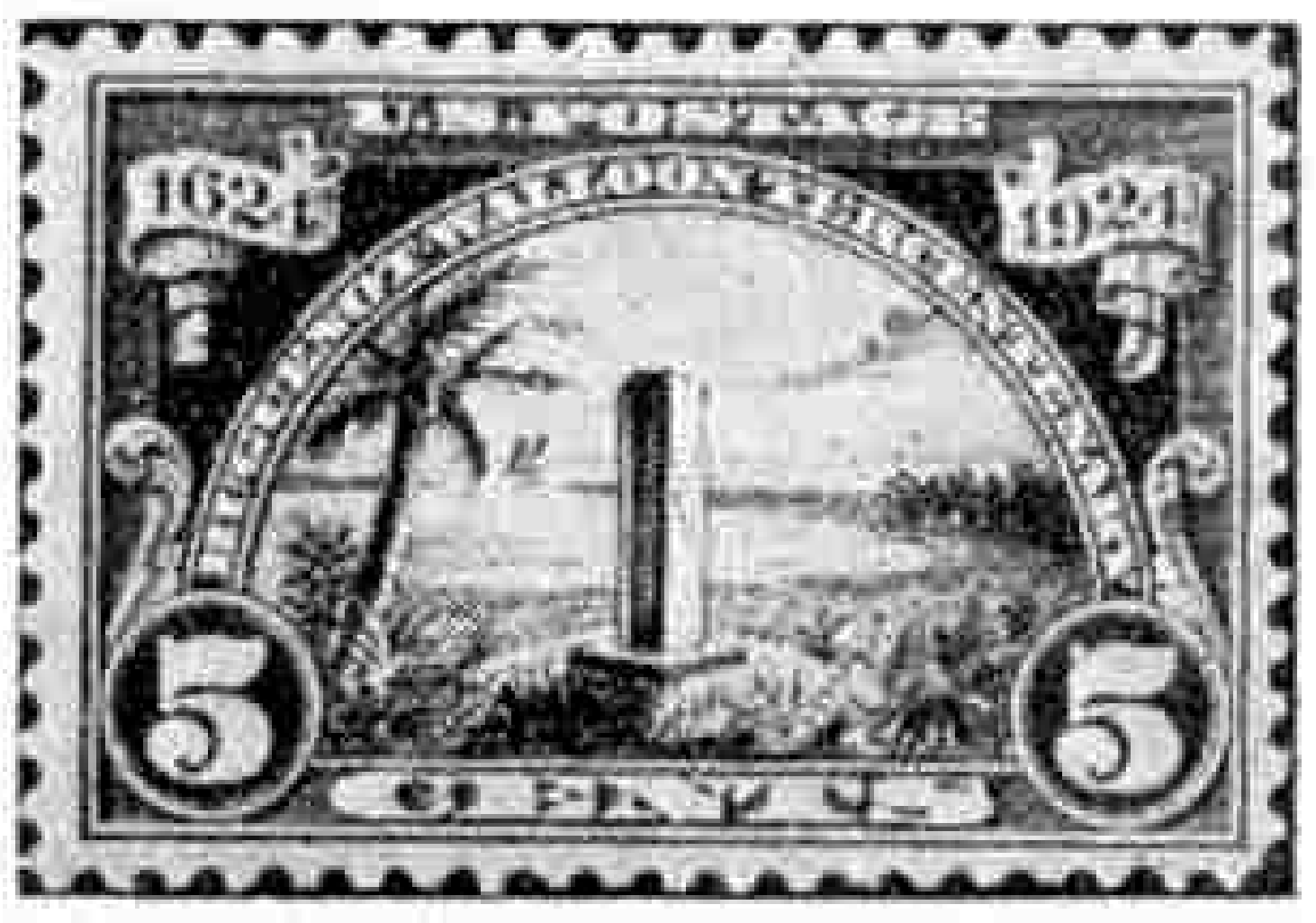
UNITED STATES

Huguenot-Walloon Tercentenary

The United States Post Office has issued several splendid commemoratives during the last few years and that consisting of three stamps to mark the third centenary of the landing of the Huguenot families is especially interesting. All three values were printed on paper with no watermark and perforated eleven. The first and, it is believed, only printing order was for 50 million of the one cent, 75 million of the two cents, and 5 million of the five cents.



The 1 cent value shows the ship *Nieu Nederlandt* ("New Netherlands.") It was in 1624 that this vessel carried to the new continent the first thirty Huguenot families to go out, under the auspices of the Dutch West India Company, in an attempt to found a Dutch colony in which they were free to hold their own religious views. The leader was the famous Admiral Coligny and the landing was made at Fort Orange, now Albany, capital of New York State. The landing is shown on the 2 cents value, this being copied from a painting by Iemoyne de Morgues, a member of the party.



The 5 cents shows a monument erected at Maryport on Saint John's River, Florida, to commemorate the first landing of Huguenots in 1562. This expedition was commanded by Jean Ribaut but as the whole party were massacred by the Spaniards in 1566, the 1624 expedition may be said to have been the first successful attempt to establish Presbyterianism in the American continent.

"Philatelic Air Post Maps"

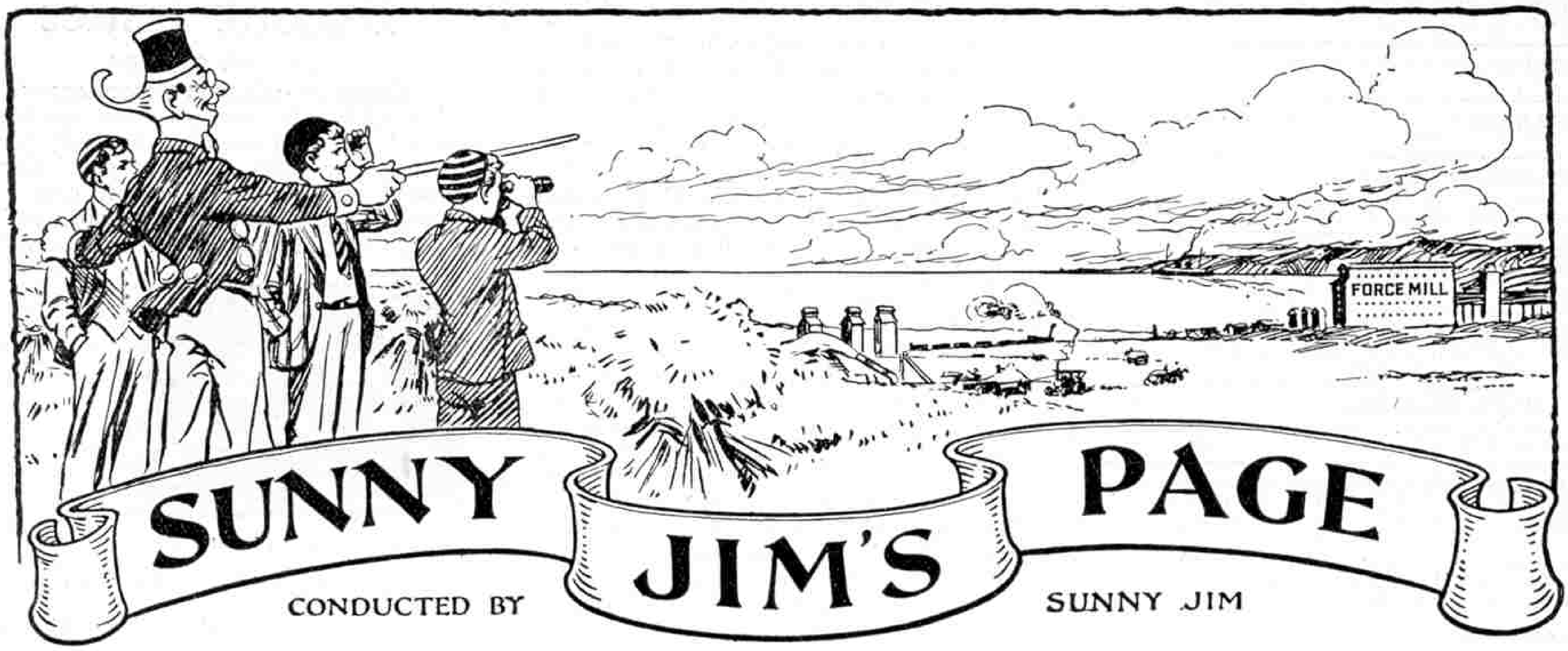
(Published by Francis J. Field Ltd.)

Price 2/- post free.

This is a series of forty maps, printed on twenty-two cards size 8½"×5½", showing various countries that have been the scene of experimental flights or commercial services. On the maps are marked the routes and dates of all the important trial flights, experimental, obsolete and present regular air routes, and the names of towns where flying meetings have been held.

The maps cover the whole world and are printed on thin card in black. They are intended to be cut out and pasted in stamp albums to illustrate the air post stamps of the various countries and are thus an excellent means of adding to the interest of a collection. A collection of air post stamps carefully mounted together with these maps would be most attractive to both collectors and non-collectors and might be the means of inducing many of the latter to become members of the "happy family" of stamp collectors.

The maps are of different sizes although printed on cards of uniform size. There are two world maps, one showing historic long distance flights and the other the world areas covered by commercial air routes at the present time. Of the other maps, seven are of European countries, eight of Asia, thirteen of the Americans, six of Africa, and four of the islands in the Pacific (including Australia and New Zealand). The lettering on the maps is of such a nature that it will harmonize with any kind of hand writing or printing on the album page. There is also a photograph showing a page of Albanian stamps mounted in an album with a map illustrating the route over which these stamps are used.



SUNNY JIM'S PAGE

CONDUCTED BY SUNNY JIM

A SERIOUS TALK

By Sunny Jim

I want you boys to listen attentively to what I have to say this month. I am going to outline to you the chief factors of a subject which is of vital importance to every one of us. The subject is **Health.** Good Health. The kind of health that can come only from a thorough understanding of the needs of the human body, and the right and proper ways of satisfying those needs.

FOOD NOT ALWAYS NOURISHMENT.

Many think that when we are hungry all we have to do is to eat and we shall be hungry no longer. This, in a sense, is true, but it is only partly true because so very much depends on what is eaten, and very much more still depends on what is digested. Food is only nourishment when it fulfils certain specific requirements. Let us learn what these requirements are.

WHY DO WE EAT ?

Why can't we live without having to eat ?

Do we all eat what does us most good ?

Here are questions that clamour for an answer. Let us try and answer them.

First of all "Why do we eat ?" We might as well ask "Why do railway engines need coal ?" The human body is, in many respects, very like a locomotive. A locomotive can't work without a head of steam. To keep steam up, the engine must be fed with a substance that will give off heat. As we know, this substance is coal.

To "keep steam up" in the human body, it too, must be fed with a substance which will give off heat. This time the substance is the food we eat.

Coal that clogs and clinkers, chokes the firebars of a locomotive and it will not run with the same efficiency as it would were it fed with a clean burning coal. Similarly, food that clogs the system reduces power of body and mind in the person who eats that food, for it is from the foods we digest that the body extracts the energy-giving **carbohydrates.**

REPAIRS "WHILE YOU WAIT."

Unlike the railway engine, the human body effects its repairs of ordinary wear and tear as it goes along. Just as bearings wear in the engine, so does muscle tissue break down under use in the human body. But while an engine must always go to "hospital" for repairs of ordinary wear and tear, the muscle tissues of the human body are built up again from other substances that are found in our food. These substances are **proteins.** They build muscle, flesh and bone. They are the elements vital for life and growth. If, for any reason, we were unable to get our daily ration of **proteins,** we should fall victims to all sorts of wasting diseases. Pale and sickly boys are often so, chiefly because they are not obtaining their proper ration of **carbohydrates** and **proteins** in the food they eat, though that food may look good and taste good.

WHAT OUR FOOD MUST GIVE US.

Carbohydrates (and **fats,** which do the same work as carbohydrates but are about 2½ times as concentrated), together with **proteins** are the three chief health and strength substances we must get from what we eat ; but there are still other substances our food must supply if we are to grow up healthy and strong. One of these other important necessities is **mineral matter. Mineral matter** occurs in food stuffs, not in large quantities, but in sufficient quantities to make all the difference between health and sickness.

Iron is highly important. Of course the iron in food is not a metal, but occurs in combination with other elements in the form of **salts. Iron** is valuable because it enriches the blood. **Calcium** (chalk) is another mineral we must have because **calcium** helps to build bone.

Sixpence a Packet Now!

Holforce Biscuits (made with "Force") are delicious, and nourishing too. They contain "Force," eggs, sugar, butter, flour and milk. Ask your grocer for them, or send 6d. P.O. to Sunny Jim and he'll send you a packet post free if you mention your grocer's name.

Many other things, too, we must get from our food, but as some of the most important have been mentioned, it will begin to be clear to us why it is so highly important for all intelligent boys to bring their minds to bear on this vital question and make sure that they are getting the right nourishment from the food they eat.

WHAT IS "GOOD FOOD ?"

How are we going to know what food is good for us, and what food, although tempting in appearance, is of no use when eaten ? It is quite an easy matter to serve up a meal that can even be luxurious, yet can be so arranged as to miss out some of the most important ingredients that are essential for life and health. Many of us now are eating food like this, yet do not realise the danger.

Good food is a diet that supplies all those things that are vital for the maintenance of good health. The right sort of food for boys will include cereals, milk, butter and cheese, vegetables and fruits. This diet would not debar such luxuries as doughnuts and pastries, but it would recommend their very sparing use, as there is little in them that is really good for one.

GOOD FOOD IS NICE FOOD.

"So, to be healthy, one must eat uninteresting food," you will think. Not so. The only things you are better off without, yet which taste nice, are pies and pastries made with white flour. It is this white flour, from which is also made our daily white bread, that is the root of many evils.

WHAT FLOUR LACKS.

White flour is wheat milled without the valuable bran coating it has when it comes from the wheatfield. This bran coating supplies many of those necessary mineral salts. It also prevents indigestion. Wheat is a cereal that has all the elements necessary to maintain vigorous health and strength, present in a proportion nearer to the ideal than in any other cereal. Wheat is the ideal food for man, but only when it is **whole** wheat. What we have to do is to find a way to prepare whole wheat for eating, yet make it taste as nice as the less nourishing pastries made with white flour. As you boys probably know, this has been done, and the result of the years of work on this important subject is "Force" Food, which, to repeat an old slogan, supplies—"Vigour and Vim" because it is "the whole wheat, flaked, cooked, malted and toasted."

WHY "FORCE" IS GOOD FOR YOU.

The special process to make wheat into "Force" does more, however, than merely make the wheat even more delicious than the finest pie-crust you ever tasted. The addition of barley malt in the cooking process helps to make the wheat more easily digestible, while the cooking process itself carries a long way forward the process of digestion, making "Force" readily assimilable when eaten. The flaking and toasting of "Force" crisps up the wheat flakes, making them delicious, but also making them give resistance to the teeth when the "Force" is chewed, thereby creating a supply of saliva, which is one of the first requirements to ensure the correct digestion of any of the foods we eat.

"FORCE" NEEDS NO COOKING.

"Force," quickly and easily served with hot milk (another ideal food complying with all the requirements necessary to produce perfect nutrition) cannot help but build up strong manly frames, and healthy virile bodies.

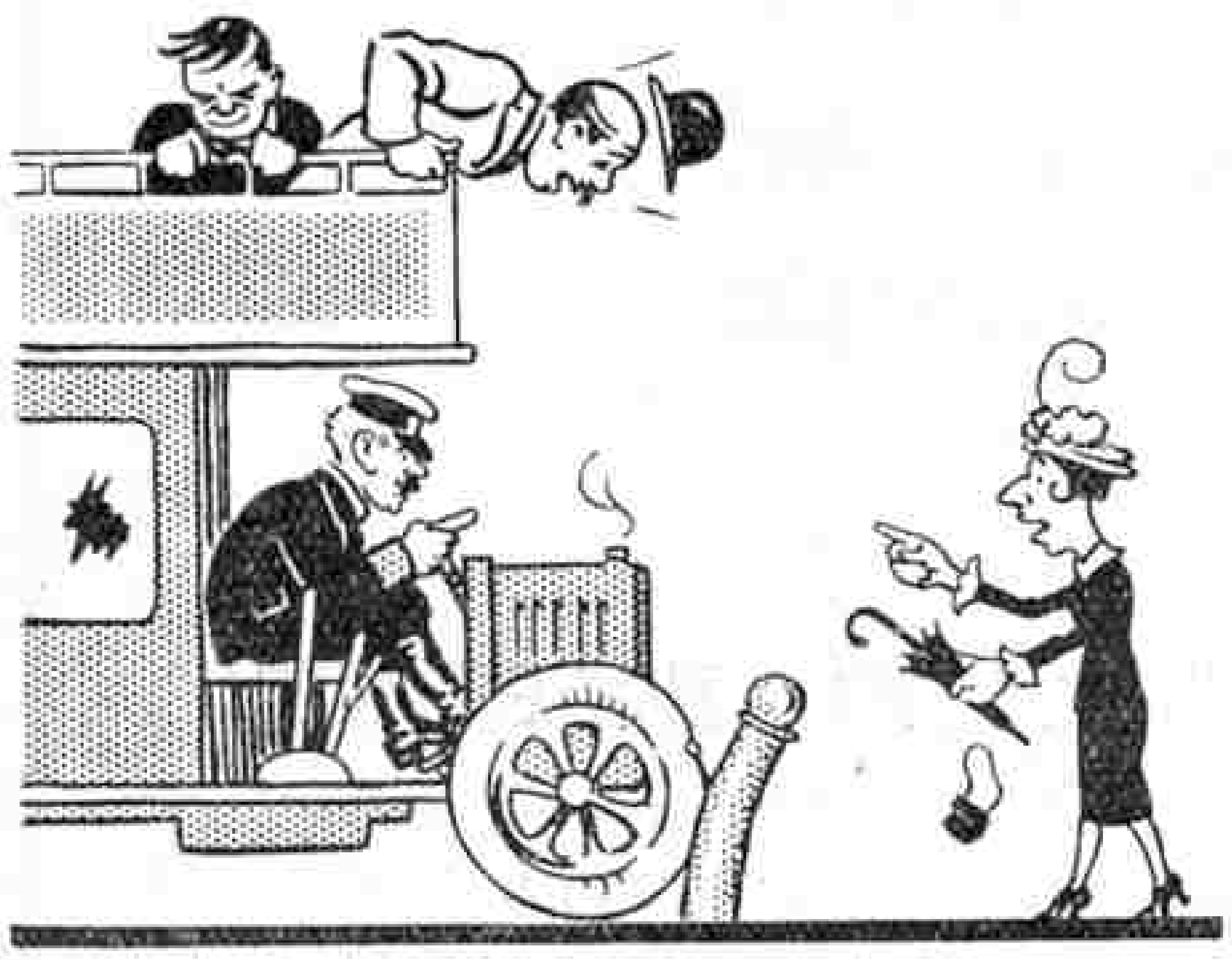
Most Meccano boys are already eaters of "Force." If you should be one of those who still has to know the delights of eating this wonderful food, do not delay a moment longer, but send to me for a free sample packet, and ask Mother to serve it with hot milk for breakfast. Once you try it you will want it always, regular size packets are obtainable at all grocers.

Sunny Jim,
197, Gt. Portland St.,
London, W.1.

NOTICE. Closing Date for "Picture" Competition announced on last month's "SUNNY JIM'S" Page is **OCT. 9th, 1926**

Fireside Fun

THE VERY IDEA!



Lady (to driver of skidding vehicle): "Now, then, you dare set your bus on me!"

* * * *

Jones, Minor, was not giving his undivided attention to the geography lesson. The teacher spotted the boy's lapse, and, pointing to the map, said:—

"On the right hand, you have Dover; now what have you on your left hand, Jones?"

Jones Minor (in a fluster): "A chilblain, mum."

* * * *

Village Lounger: "What sort of a chap be the new curate, parson?"

Vicar: "Oh a splendid fellow, he is an M.A."

Village Lounger: "Ay, Ay, but will his trousers fit oi?"

* * * *

LOGIC!

"How do you parse 'Mary milked the cow?'" asked the school teacher.

"Cow is a noun, feminine gender, third person, singular number, and stands for Mary," replied Tommy Green.

"Stands for Mary!" exclaimed the teacher.

"Because," answered Tommy, "if the cow did not stand for Mary, how could Mary milk it?"

* * * *

"Yes," said the second mate of the tramp steamer on his return home, "when I was in the Mediterranean I sailed through shoals of sardines."

"Nonsense," said his maiden aunt, "how could they possibly swim in those small tins!"

This Month's Short Story

There was a thin maiden called Lena,
Who worked with a vacuum cleaner,
She got in the way
Of the suction one day,
Since when nobody has seen her.

* * * *

"I'm looking for my ideal dog," said the lady in the canine fancier's shop. "I'd like one with a head rather like a collie and a body after the style of an Irish terrier, only with longer hair and nice, distinct markings. Do you keep dogs like that?"

The dog fancier shook his head sadly. "No, ma'am," he said. "I drowns 'em."

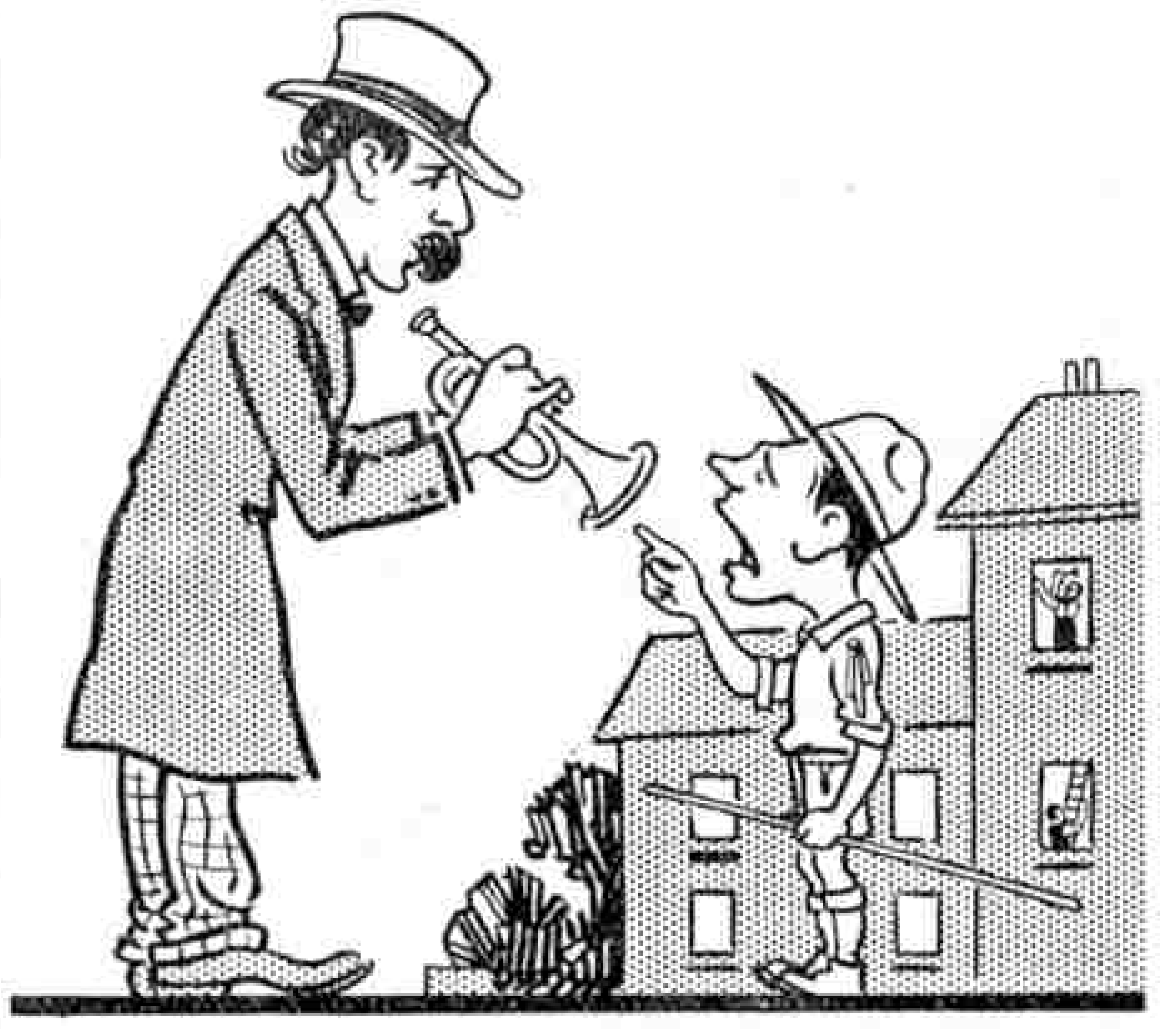
* * * *

Teacher: "How did you get that black eye, William?"

William: "Please, miss, I sprained it doing sums."

* * * *

HIS DAY'S GOOD TURN!



Boy Scout (to Musician): "P-please, sir, would you mind moving on? You must not blow that trumpet around here yet."

Musician: "Why not?"

Boy Scout: "It ain't safe! You know what happened to the walls of Jericho!"

* * * *

Teacher: "What people are scattered all over the earth?"

Class (as one voice): "Pedestrians, sir."

* * * *

THE GO-GETTER!

"What position did you hold in your last place?" asked the employer.

"I was a doer, sir."

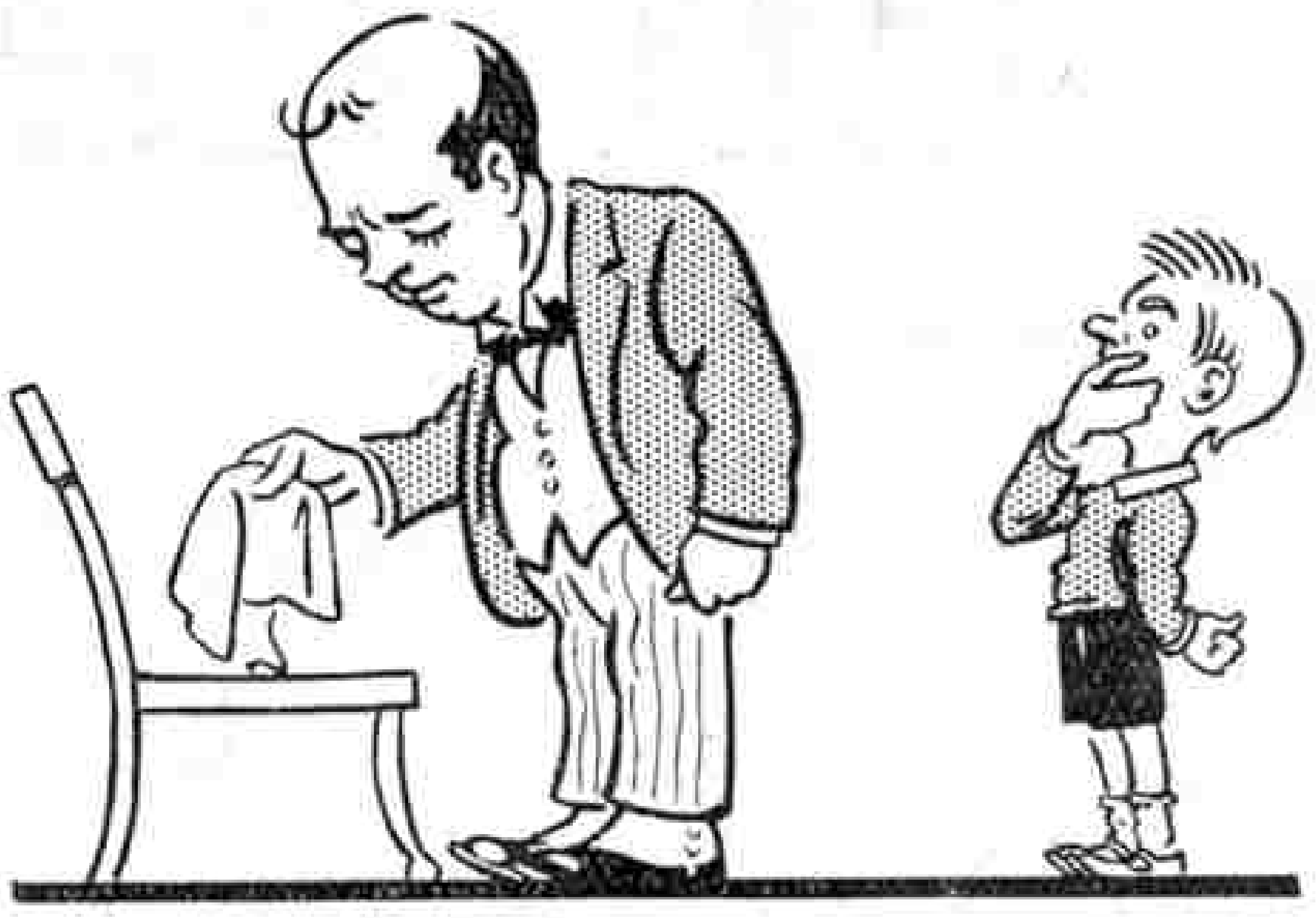
"A doer! What's that?"

"Well, sir, you see, when my boss wanted anything done he would tell the cashier, the cashier would tell the book-keeper, the book-keeper would tell the clerk and the clerk would tell me."

"And what would happen then?"

"Well, sir, as I had no-one to tell it to, I did it."

SAFETY FIRST!



Mrs. Nagatem: "Richard, your manners are getting worse. To-day, at Mrs. Smith's, I saw you take out your handkerchief and wipe your chair before you sat down. And worst of all; their darling little boy was watching you."

Mr. Nagatem: "Yes, my dear, and I was watching the darling little boy, too. I'm too old a bird to be caught on that bent-pin stunt."

* * * *

"George, what does C A T spell?" asked his schoolmaster.

"Please, sir, I don't know."

"Don't know? Why, what does your mother use to catch mice?"

"A trap, sir."

"Pooh! What animal is it that is fond of milk?"

"Oh, I know sir. A baby, sir."

"No! no! no! What was it scratched your sister's face?"

"My nails, sir."

"Oh, you dunce! Now look! Do you see that animal on the fence there?"

"Yes, sir."

"Very well then. Now tell me what does C A T spell?"

"Kitten, sir."

Collapse of schoolmaster.

* * * *

MISUNDERSTOOD!

A woman sat down at a vacant table in a London restaurant, and, after consulting the menu, ordered some whiting. The waitress went away; nearly a quarter of an hour passed and still she did not return.

At last the visitor grew impatient, and getting up from the table she discovered the girl talking in a corner with other waitresses.

"Why haven't you brought my fish?" demanded the hungry customer.

"What fish?" replied the girl.

"Why, the whiting I ordered, of course."

"Oh!" was the astonishing answer, "I didn't know you ordered anything; I thought you said you was just 'wyting'!"

* * * *

Q. What causes the flight of time?
A. The spur of the moment.

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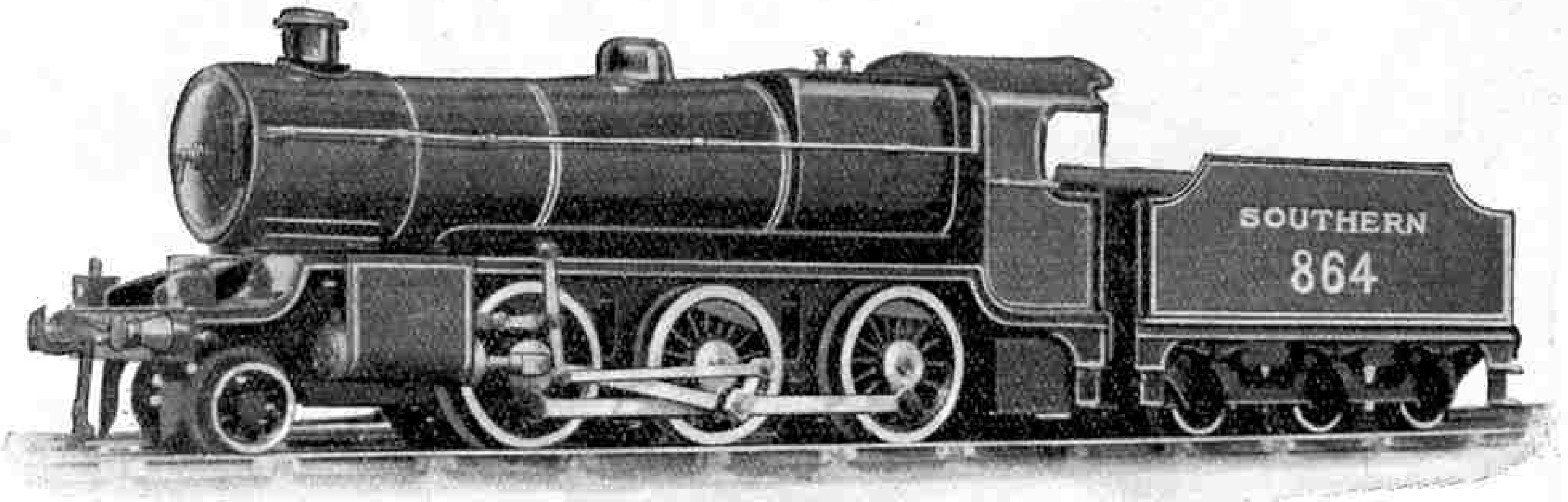

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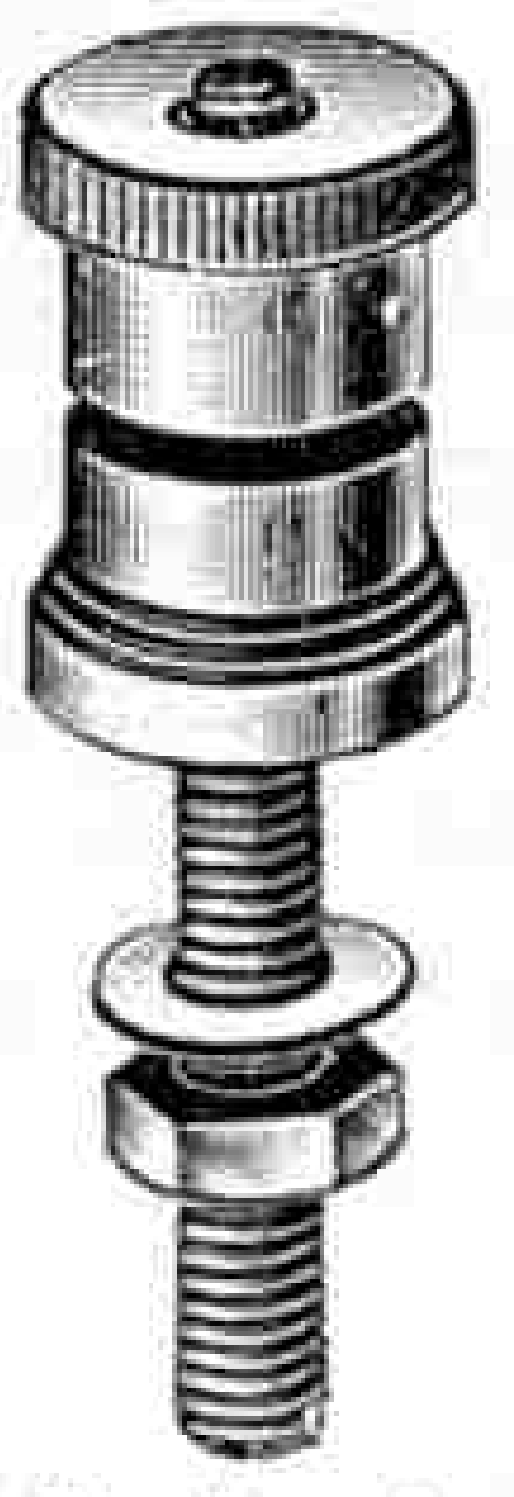

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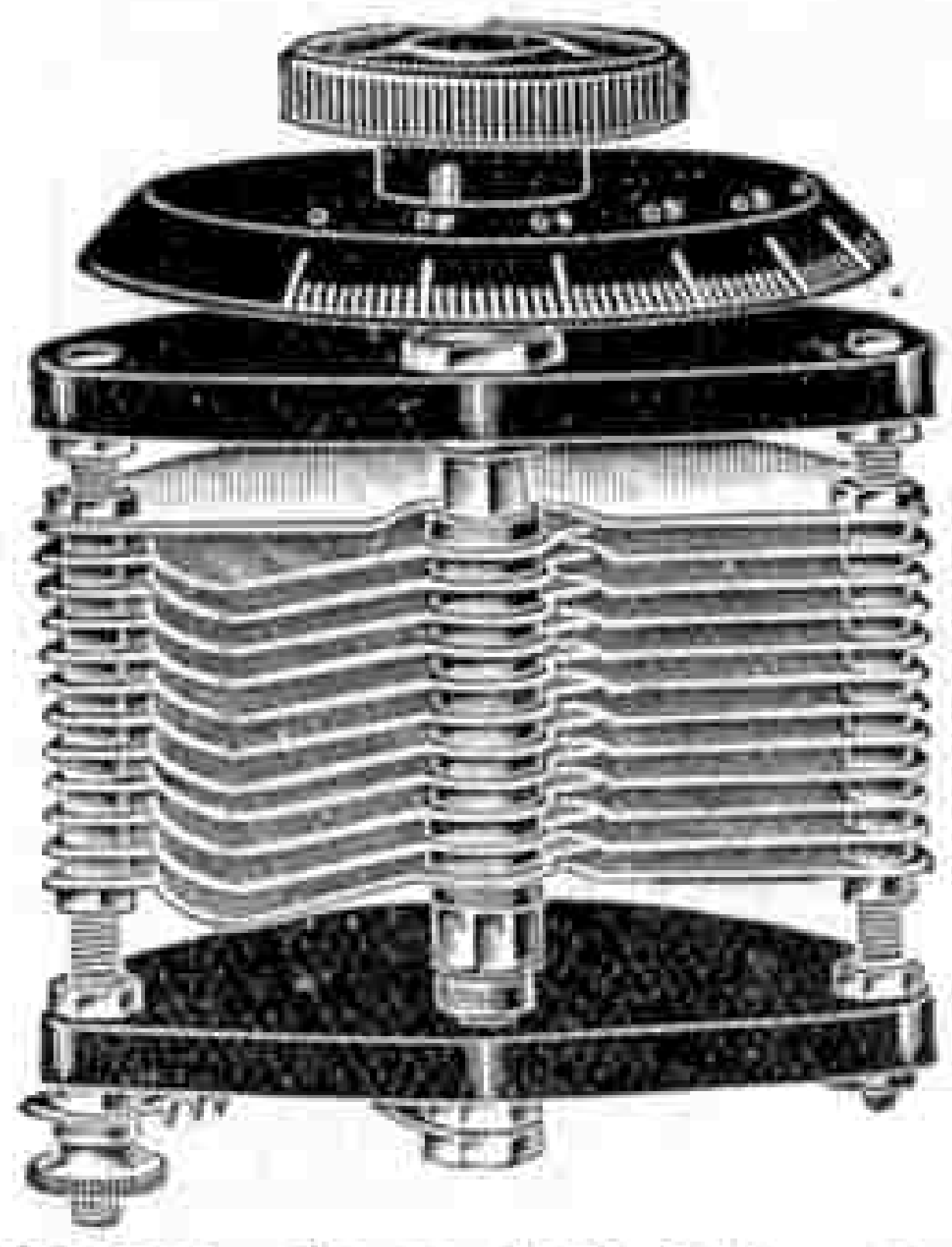

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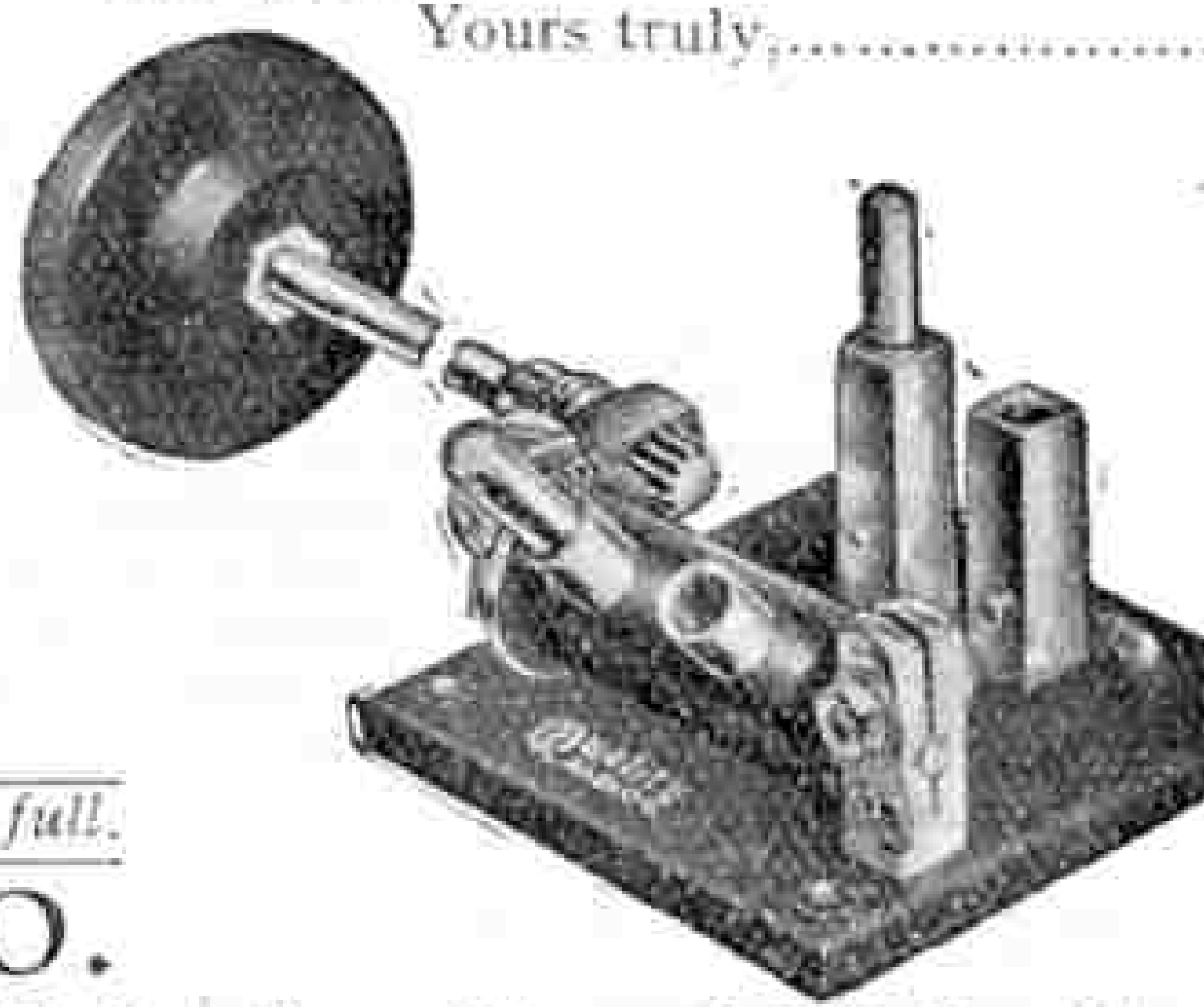

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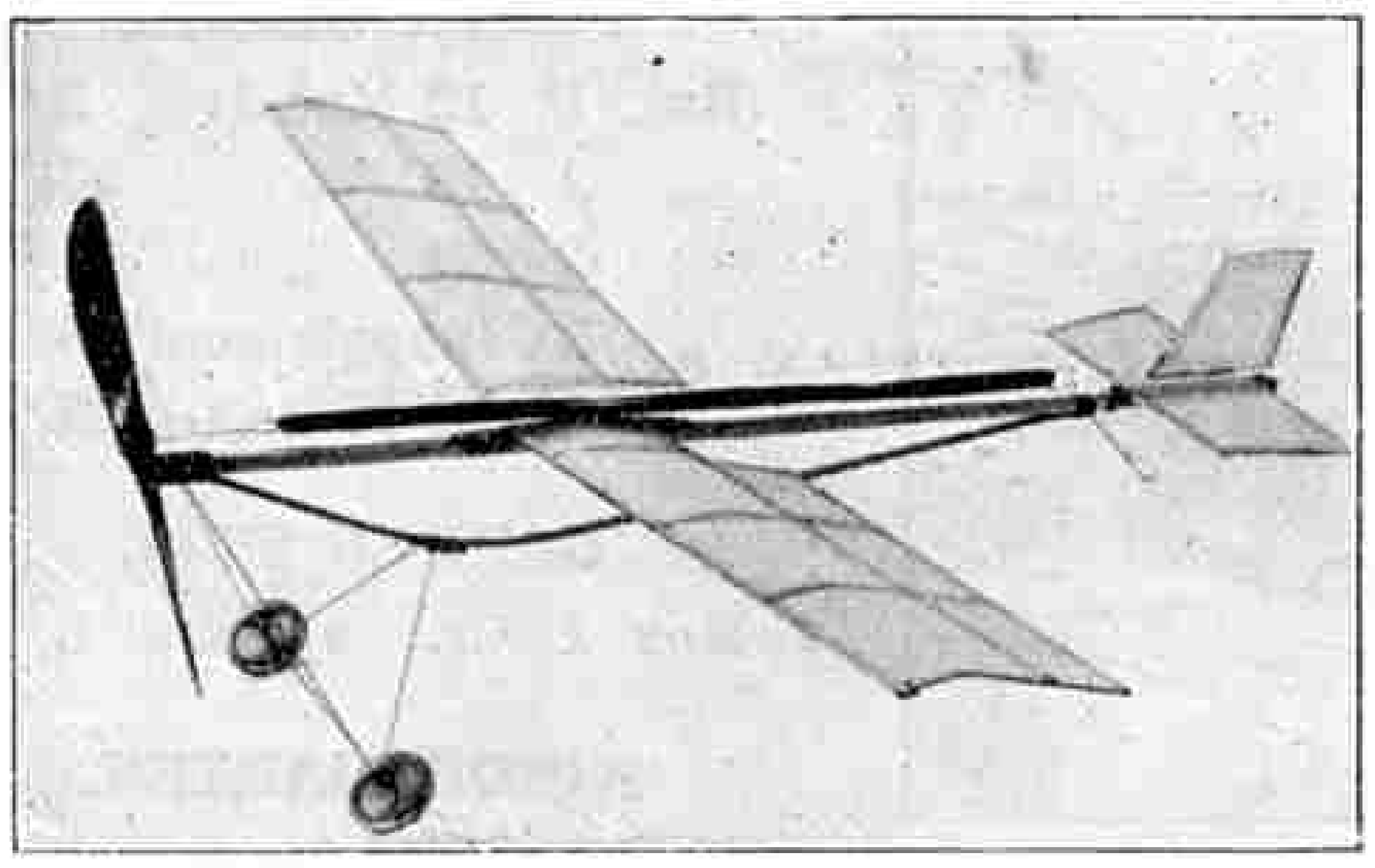

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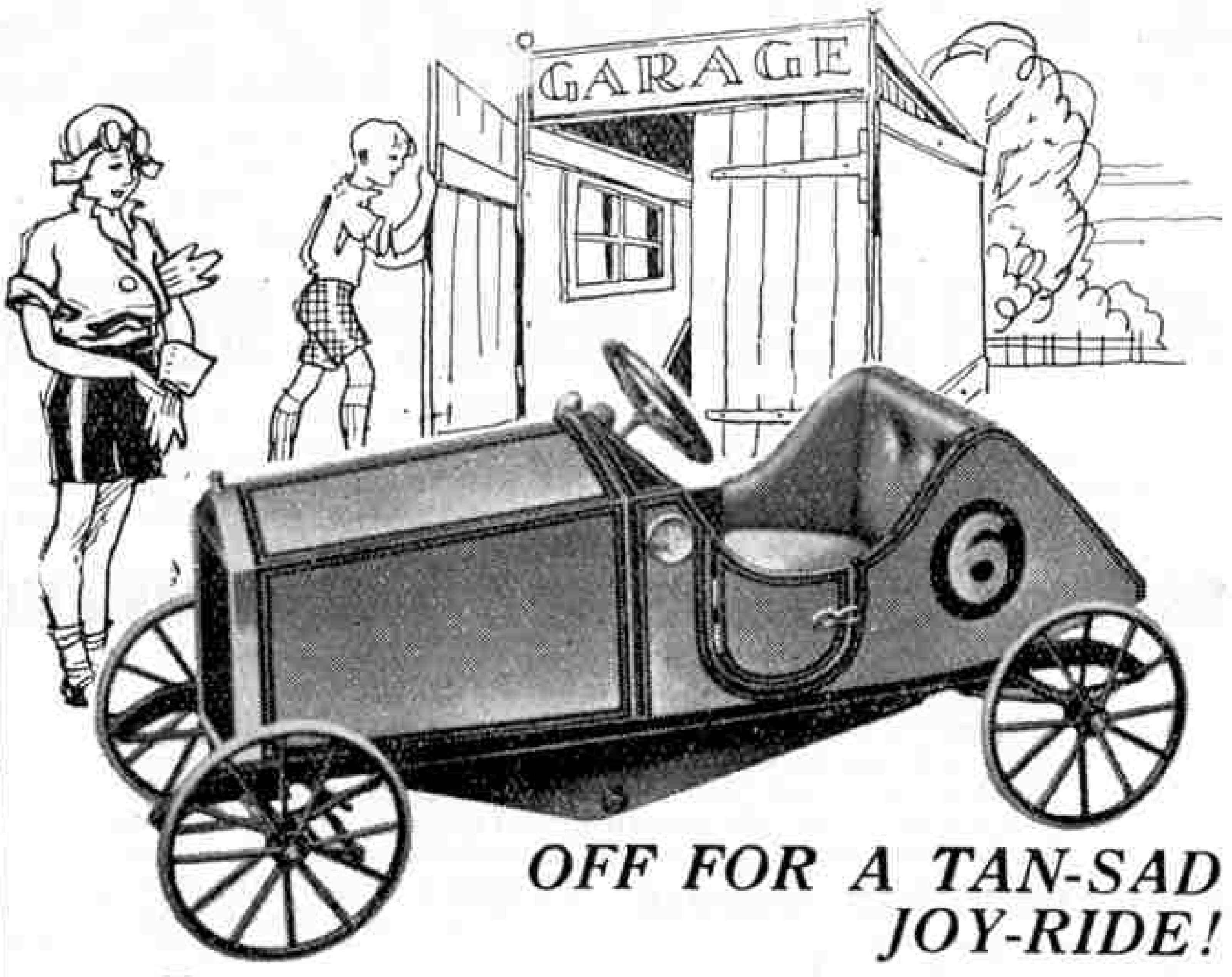

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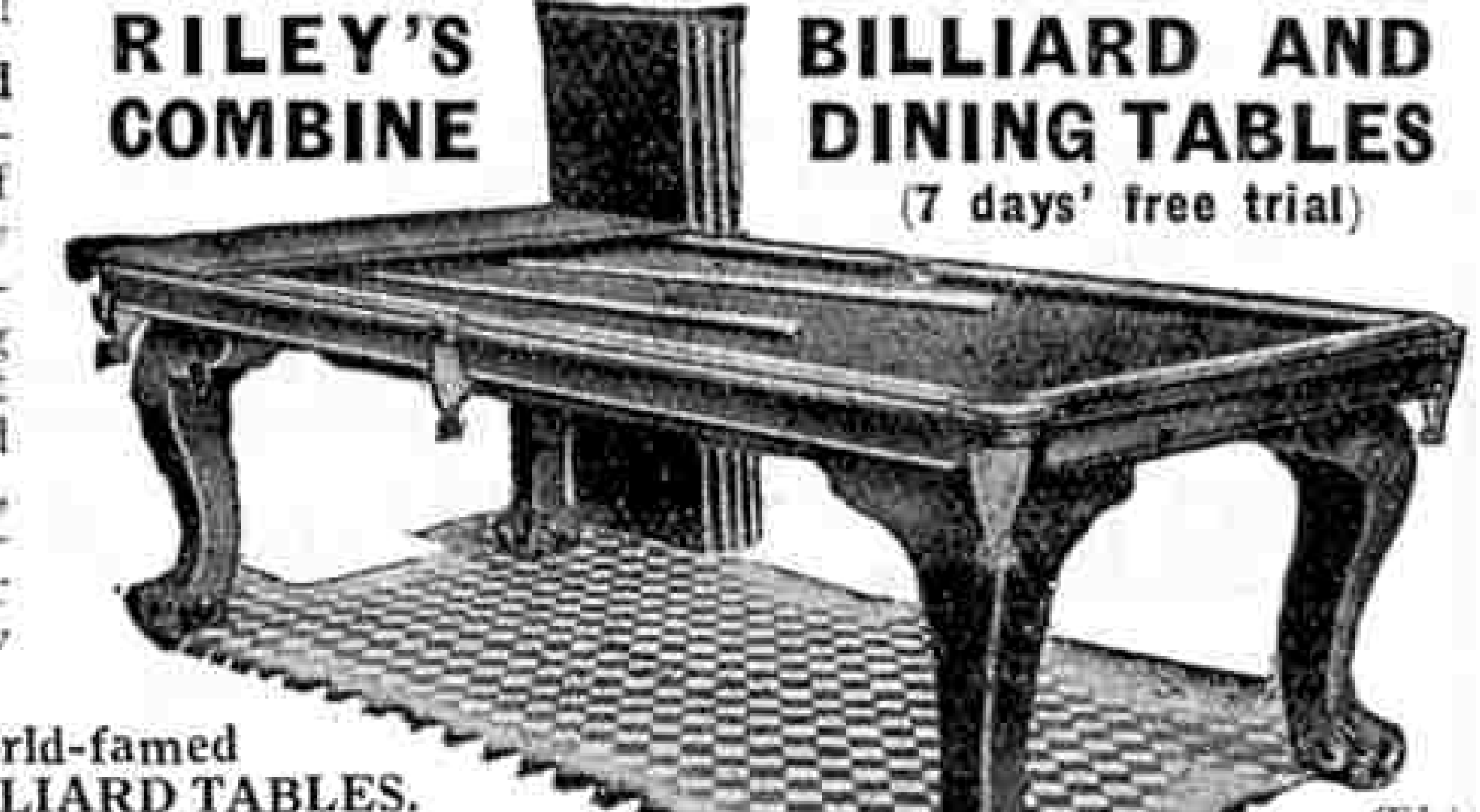

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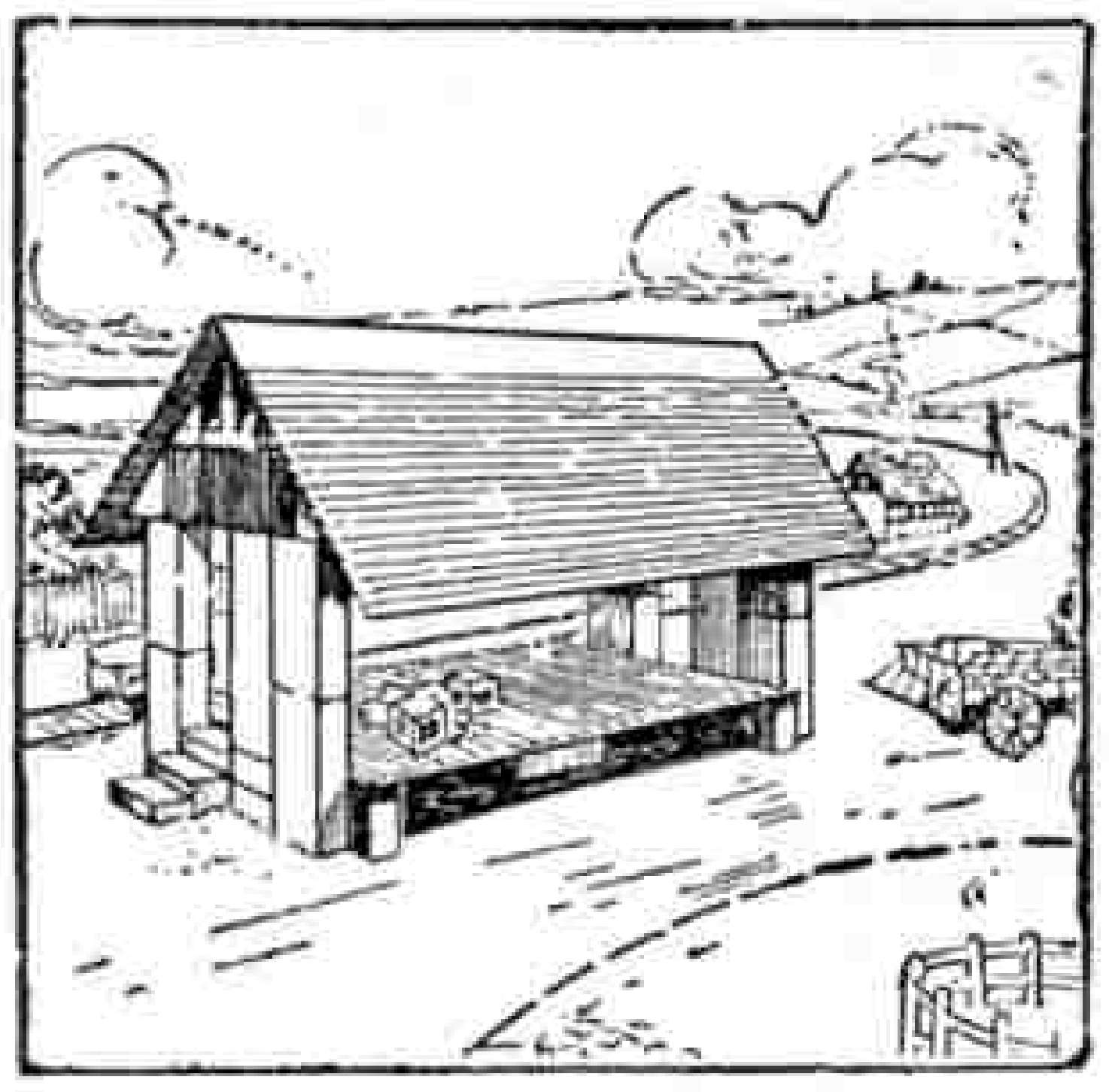

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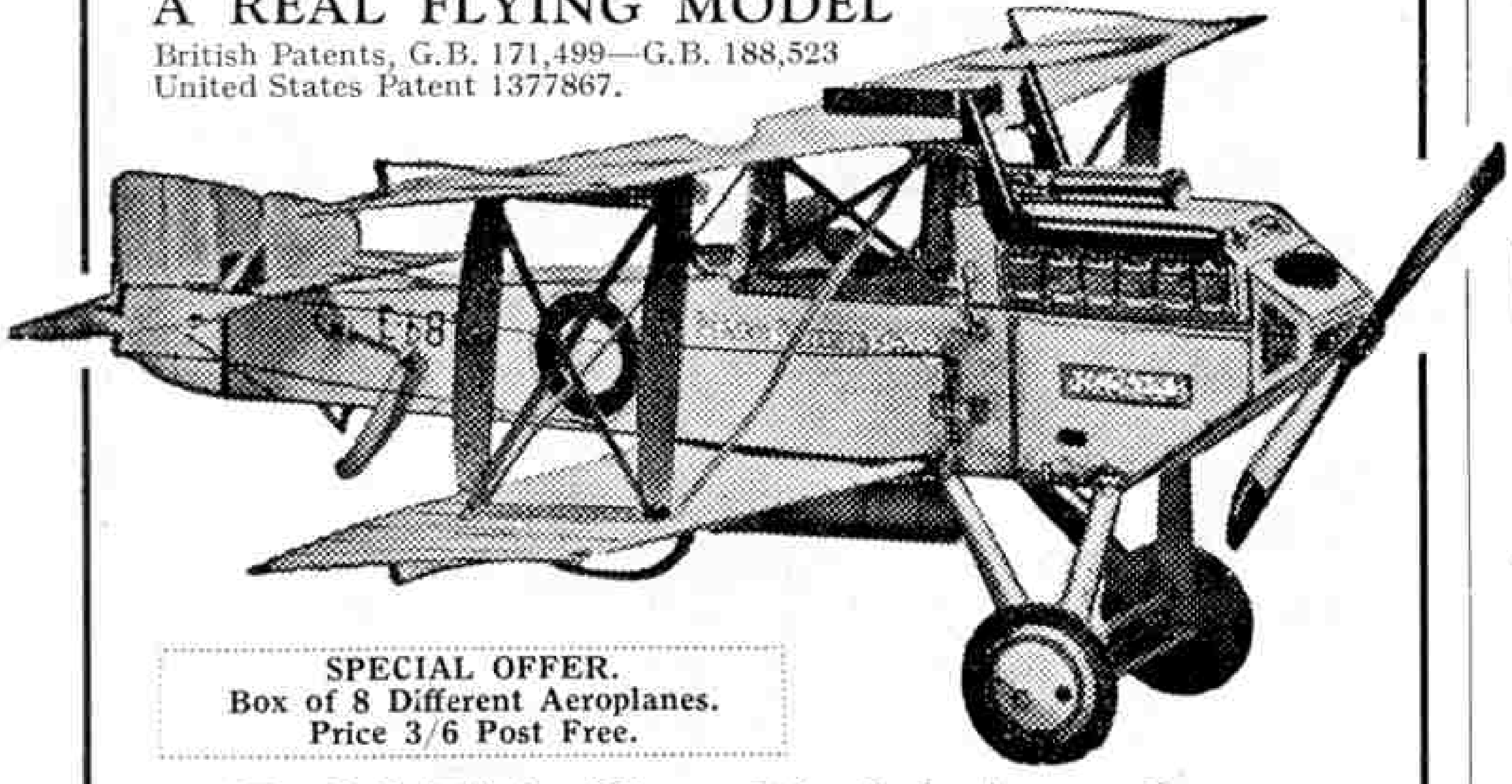

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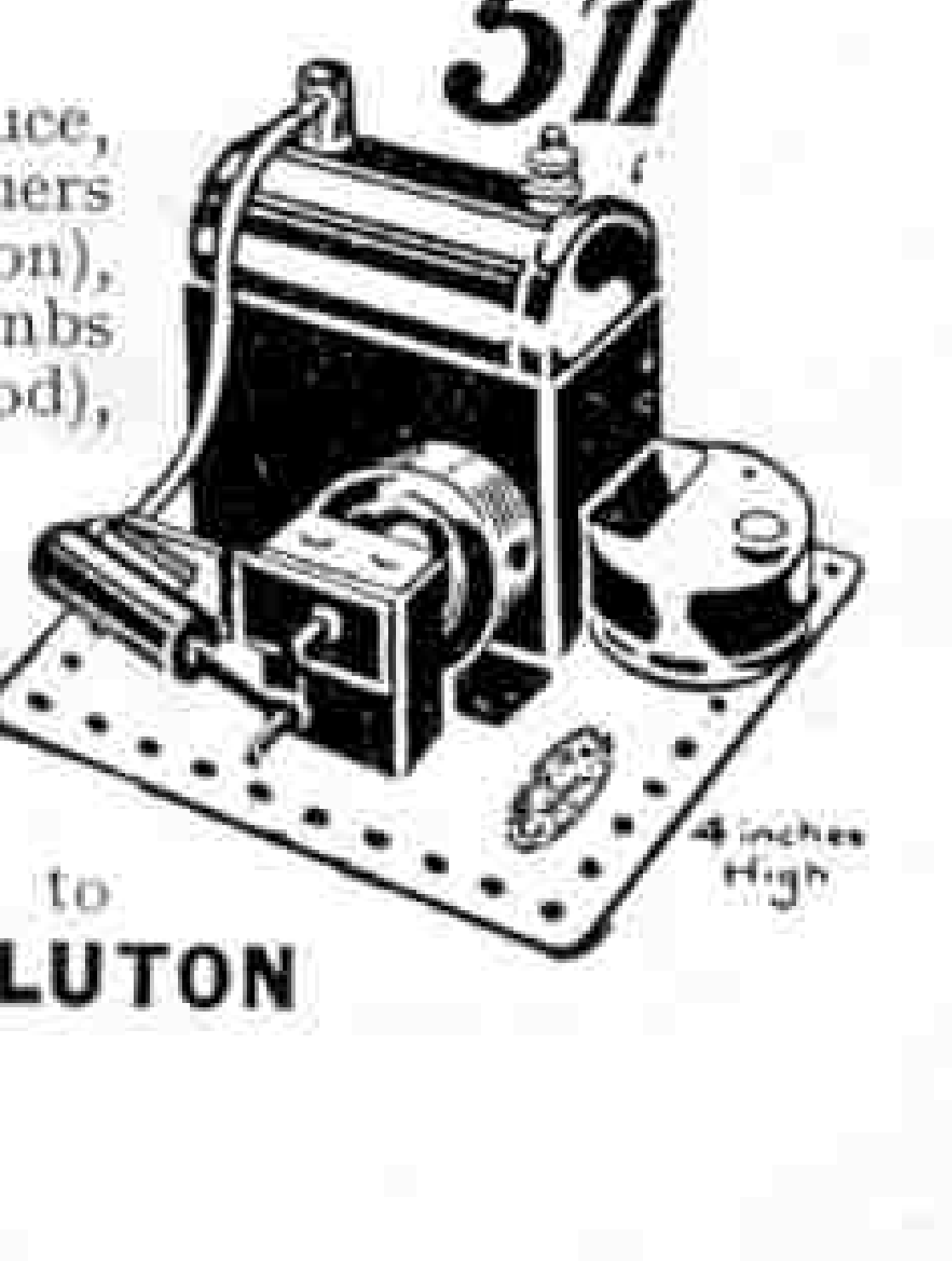

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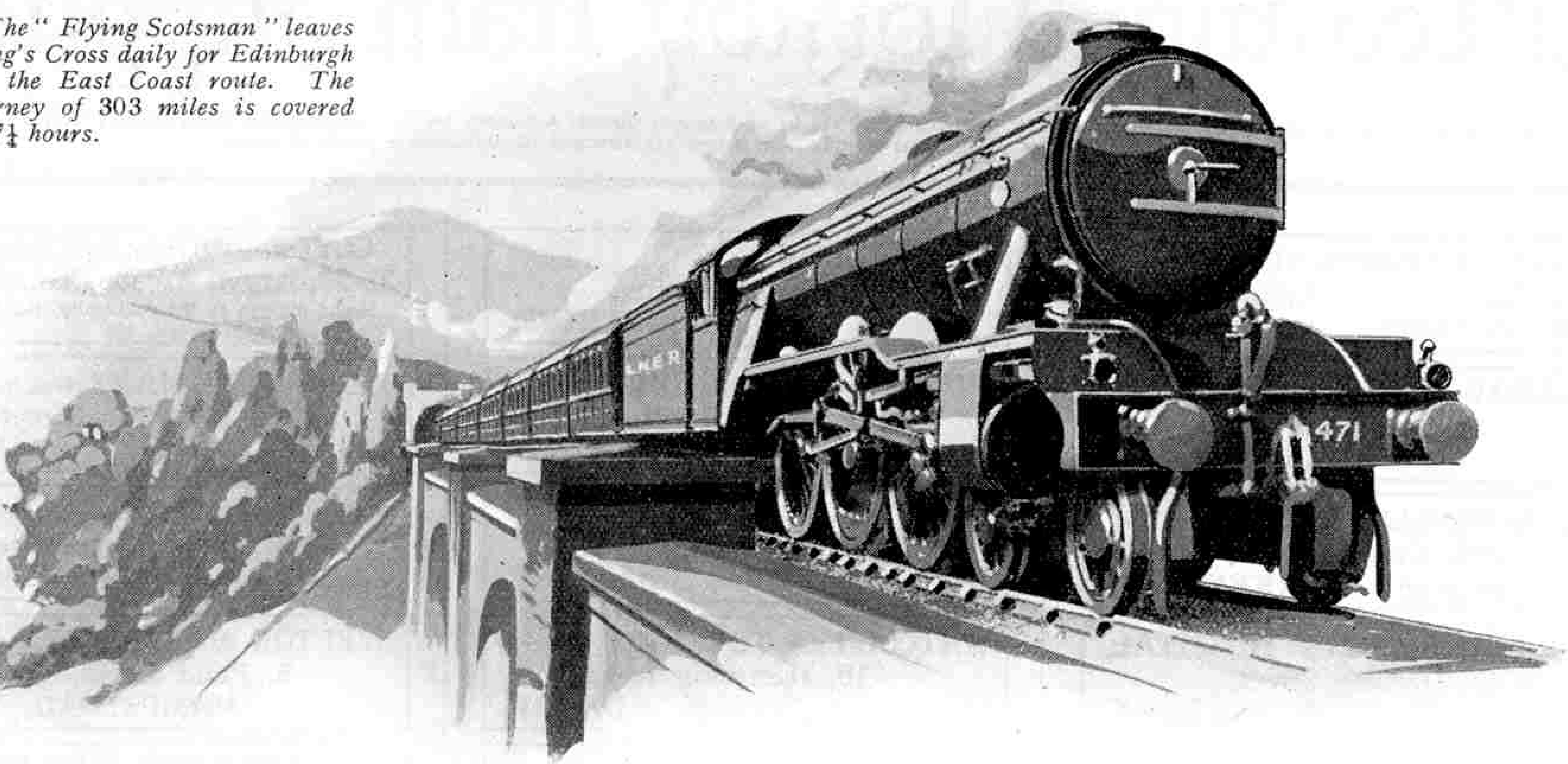

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Each Hornby Set is packed in a strong, handsome box and is supplied with a complete set of rails. The locos and various components are carefully examined and tested before leaving the factory, and they are guaranteed.

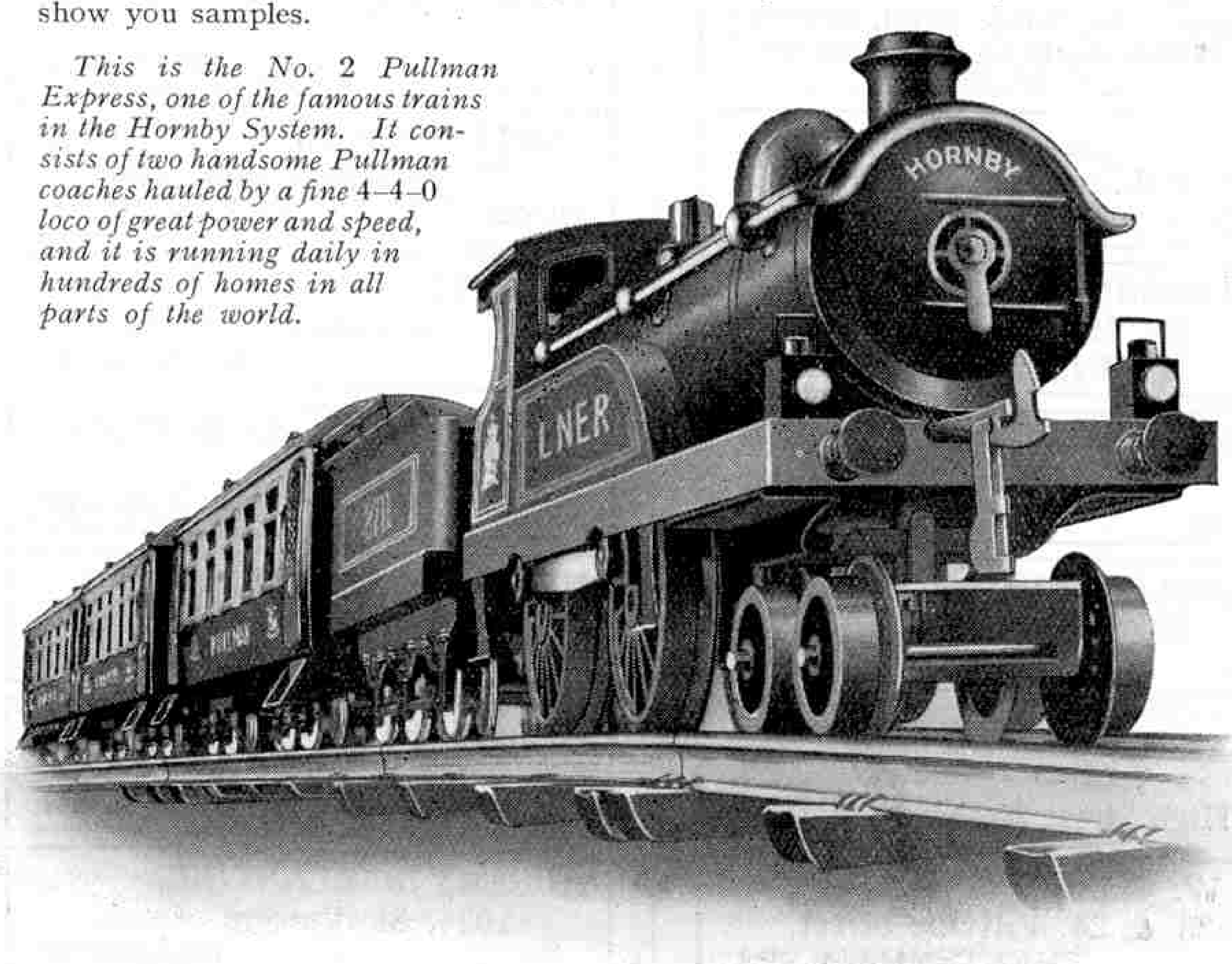
PRICES

No. 0 Passenger Set ...	**24/–**
No. 0 Goods Set ...	**17/6**
No. 1 Passenger Set ...	**27/6**
No. 1 Goods Set ...	**21/–**
No. 2 Pullman Set ...	**60/–**
No. 2 Goods Set ...	**37/6**
No. 1 Tank Goods Set	**25/–**
No. 2 Tank Goods Set	**45/–**
No. 2 Tank Passenger Set	**45/–**

WHEN you own a Hornby, you can enjoy the fun of running your own complete railway system. It's the finest fun in the whole world, and you will find that even your father will want to help you when you've fixed up a Hornby Railway !

See how long a Hornby Loco runs without re-winding. See how it gets up speed with a heavy load behind it, and how smoothly it rides over the points and crossings. And how fine and sturdily built are Hornby Trains. How real they look. How beautifully they are enamelled in the correct colours. Every part of a Hornby Railway is like that—strong and beautifully finished. Ask your dealer to show you samples.

This is the No. 2 Pullman Express, one of the famous trains in the Hornby System. It consists of two handsome Pullman coaches hauled by a fine 4–4–0 loco of great power and speed, and it is running daily in hundreds of homes in all parts of the world.



Manufactured by
MECCANO LTD.,
BINNS ROAD,
LIVERPOOL.

Meccano & Hornby Train Supplies

All the dealers whose advertisements appear on this page carry full stocks of Meccano Outfits, Accessory Outfits and Meccano parts, Hornby Trains and Hornby Train Accessories all the year round. The names are arranged in alphabetical order of town.

ACTON'S SPORTS SUPPLY CO.,
ACTON. EALING.
WIMBLEDON. HARLESDEN.

HARRY BROWN,
1, Moss Lane,
ALTRINCHAM.

J. WOODHALL,
256, Grange Road,
Phone : B'head 621 **BIRKENHEAD.**

MERCER'S DOLLS' HOSPITAL,
68, Darwen Street,
BLACKBURN.

SELLEN'S BAZAAR,
54, Waterloo Road,
BLACKPOOL, S.S.

BROWN, MUFF & CO. LTD.,
BRADFORD.

W. CARTER,
15, Bridge Street,
opp. Mechanics' Institute, **BRADFORD.**

JOHN TAYLOR,
28, Preston Street,
Tel. : Brighton 957 **BRIGHTON.**

GYLES BROS. LTD.,
Tel. 2888 24, Bridge Street, **BRISTOL.**
188, Whiteladies Road, Clifton, **BRISTOL.**
Tel. 143

JOHN HALL (TOOLS) LTD.,
BRISTOL. NEWPORT.
CARDIFF. SWANSEA.

SALANSON LTD.,
20, High Street, **BRISTOL.**
4, High Street, **CARDIFF.**

SAM TAYLOR,
Silver Street,
Tel. 320 **BURY.**

HAROLD HUNT,
38, Spring Gardens,
Tel. 202 **BUXTON.**

A. M. HARRIS,
"Wilces Toy Shop,"
14, High Street Arcade, **CARDIFF.**

H. W. GILL,
23 & 24, Pittville Street,
CHELTENHAM SPA.

R. H. JEPSON,
1, Cross Cheaping,
COVENTRY.

PURSEY & MOCKRIDGE,
The Sports Outfitters,
Tel. Dartford 173 **DARTFORD.**

HENRY WHALLEY,
195, Duckworth Street,
DARWEN.

RATCLIFFES TOYERIES,
19, Osmaston Road,
DERBY.

C. E. MELLER,
"Dolls' Hospital,"
DONCASTER.

JOHN ARCHIBALD,
20, Woolcomber Street,
DOVER.

JAMES L. DIXON,
14, Suffolk Street,
(off Grafton St.) **DUBLIN.**

DIXON'S,
41, High Street,
DUNDEE.

DRAFFEN & JARVIE LTD.,
Nethergate,
DUNDEE.

CARTER'S STORES,
2, Terminus Buildings,
Tel. 953 **EASTBOURNE.**

BASSETT-LOWKE LTD.,
1, Frederick Street,
EDINBURGH.

WRIGHT'S DOLLS' HOSPITAL,
14, High Street,
ERDINGTON.

UPTON BROS. LTD.,
Sandgate Rd. and Tontine St.,
FOLKESTONE.

HARRY HUBBARD,
8, High Street,
(Opposite the Cricketers) **GILLINGHAM.**

ROBERT BALLANTINE,
103½, St. Vincent Street,
GLASGOW.

CLYDE MODEL DOCKYARD,
22-23, Argyll Arcade, **GLASGOW.**
Model Makers to the Admiralty, the Railway Coys., etc.

The MARVEL MART (Wm. Ross & Co.),
110, West Nile Street,
GLASGOW.

POLLOCK & CO., 36, Bridge St. and
222 and 245, Argyle Street
and 39, Paisley Rd. West, **GLASGOW.**

WELTON & MESSENT,
5, Pond Street,
HAMPSTEAD, N.W.3.

FLETCHER'S TOYLAND,
77, Deardengate, **HASLINGDEN.**
Grand Building, **RAWTENSTALL.**

HAMMOND'S LTD.,
Paragon Square,
HULL.

SMITH & DANIELS,
59, Westgate St., **IPSWICH.**
25, Market Place, **GT. YARMOUTH**

W. J. S. CARPENTER,
13 & 15, Queen Victoria Street,
LEEDS.

PEARSON & DENHAM (PHOTO) LTD., 6, Bond Street,
LEEDS.

ROBOTHAM,
"Baby's Kingdom,"
Tel. 4809 **LEICESTER.**

LLOYD & SON,
2, Station Street,
LEWES.

BYCROFTS EMPORIUM,
366, High Street,
LINCOLN.

C. LUCAS, Hobbies Depot,
35, Manchester Street,
LIVERPOOL.

Reliance Cycle & Motor Co.,
29/31, Manchester St., Liverpool.
Argyle & Conway Sts., Birkenhead.

THE ARUNDEL CYCLE & MOTOR STORE, 52, Church Road,
Upper Norwood, **LONDON, S.E.19.**

Meccano & Hornby Train Supplies

The twenty-eight dealers whose advertisements appear on this page carry full stocks of Meccano Outfits, Accessory Outfits and Meccano parts, Hornby Trains and Hornby Train Accessories all the year round. The names are arranged in alphabetical order of town.

W. HUMPHRYS & SON,
Estab. in 1840 269/271, Rye Lane,
Peckham, LONDON.

F. R. POTTER & SON,
43, Market Place,
LOUGHBOROUGH.

H. G. PARTRIDGE & CO.,
10, Chapel Street,
Tel. 234 LUTON.

BARR'S CHILDREN'S PARADISE,
49, Deansgate,
Tel. City 165 MANCHESTER.

BAXENDALE & CO. LTD.,
Miller Street,
Tel. 5900 City (20 lines) MANCHESTER.

A. FRANKS LTD.,
95 & 97, Deansgate, MANCHESTER.
90, Bradshawgate, BOLTON.

A. INMAN,
Moorfield Arcade, 105, Lapwing Lane,
Didsbury, MANCHESTER.

JOHN NESBITT LTD.,
42, Market Street,
MANCHESTER.

H. WILES LTD.,
124, Market Street,
MANCHESTER.

SHAW'S BAZAARS,
30-36, High Street,
MARGATE.

R. SCUPHAM & SONS,
35, Linthorpe Road,
MIDDLESBROUGH.

DIBBS' DOLLIES' HOSPITAL,
NELSON, LANCS.

ALFREDS, TOY SHOP,
77, Northumberland Street,
NEWCASTLE-ON-TYNE.

WILLIAM OLLIFF,
13, Grainger Street West,
NEWCASTLE-ON-TYNE.

THE OXFORD SPORTS DEPOT,
117, St. Aldates',
OXFORD.

JANES & ADAMS,
13, The Promenade,
And Branches. PALMERS GREEN.

A. J. ROBERTSON,
39-41, Broad Bridge Street,
Tel. 374 PETERBOROUGH.

R. MARSDEN & SON LTD.,
115, Church Street,
Tel. PRESTON 1314 PRESTON.

DEAN & HOLT,
78, Yorkshire Street,
ROCHDALE.

SHEFFIELD PHOTO COMPANY,
6, Norfolk Row (Fargate),
'Phone 3891 SHEFFIELD.

A. J. TINKER,
20, London Road,
SHEFFIELD.

WILSON, GUMPERT & CO. LTD.,
57, Fargate,
Tel. 489 SHEFFIELD.

BIRMINGHAM & COVENTRY CYCLE CO., 140 & 151, Above Bar,
SOUTHAMPTON.

OSBORN & CO.,
9, High Street,
SOUTHAMPTON.

S. T. SIMPSON & SON,
589-595, Lord Street,
Tel. 999 SOUTHPORT.

H. W. GINN,
The London Motor, Cycle & Sports Co.,
106, High Street, STAINES.

TAYLOR BROS.,
Great Underbank,
Tel. 630 STOCKPORT.

SPORTS HOUSE
WOKING & WEYBRIDGE.

STAMP PERFORATION GAUGE

Stamp collectors will find this card extremely useful in enabling them instantly to find the size of perforation of any stamp. Price 1d. (post free) from the Editor, "*M.M.*"

Mend your Punctures while you Ride

FORGET TYRE TROUBLE

and go care - free on your way. Tubes treated with our IMPERVO increase the joys of your Cycle.
"The Story of IMPERVO"

FREE

to Meccano Readers.
Write NOW for a Copy.
H. COLYER & CO.
(Dept. 31a),
5, Point Hill, Greenwich, S.E.10.

Don't Do This!

Don't carry the milestones on your mind. Fit a

VEEDER CYCLOMETER

on your Bicycle and let it register the miles for you.

You can rely on its accuracy.

REGULAR 6/6
TRIP 15/-

Insist upon a genuine VEEDER

See our name thereon.

A Book Every Boy Should Have. GET IT NOW!

The Compendium of Applied Electricity

A comprehensive book on the subject giving details of electricity in nature, in experiments and in practical use. Fully illustrated and with dictionary of electrical terms at the end. **2/2** Post Free.

Get our list of Technical Books.

S. RENTELL & CO. LTD.,
38, Maiden Lane, LONDON, W.C.2.

THE WORLD'S GREATEST CYCLE OFFER

£10 FOR £6

The frame of the Graves **'Speed King'** Cycle is rust proofed, enamelled Black & Coach lined (or can be supplied all Black if desired) Fitted with

B.S.A. 3-SPEED GEAR
DUNLOP Roadster Cord Tyres
RENOLD CHAIN
MIDDLEMORE'S Three Coil Spring Saddle

Lady's or Gent's model same price, Carriage Paid. Terms: 8/- now, & 8/- monthly. Complete Approval

8/- NOW

10 YEARS WARRANTY

£6:0:0

Catalogue Post Free. J. G. Graves Ltd. Sheffield.

2 FREE GIFTS! **PURSE & POCKET KNIFE Given Away to all who buy a Pen!**

THE "SILKRITE" Registered **SELF-FILLING FOUNTAIN PEN.** Over 5,000 Testimonials received. **Guaranteed 5 Years' Wear.** **1/6**

G. FRANCIS, Esq., writes: "25 Pens have I purchased and all my friends are perfectly satisfied." M. G. POWELL, Esq., writes: "Delighted with 'Silkrite' Pen. It equals any other **make at 10/-.**"

2 FREE GIFTS! With every Pen at 1/6 each, and 3d. extra for postage of **gifts, we GIVE FREE a Real Leather LOCK PURSE** and a Handsome **POCKET KNIFE** (2 blades) as sketch. *Write for 1926 Gift Cat., Richly Illus., full of Big Bargains, Jewellery, Fancy Goods, Post Free!* Our 21st Year of Business!—**THE LEEDS BARGAIN CO.(M), 31, Kendal Lane, LEEDS.**

Good News

Hobbies 1927 Catalogue

is now ready.

1/6 Design included. 9d. post free.

BASSETT-LOWKE'S
New Railway Catalogue
New Ship Fittings Catalogue
Post free **6d.** each.

Lists for Wireless, Meccano, Model Railways, Motor Boats, Mouldings, now ready—Free.

PHOTOGRAPHY

Let us develop your films. We will enlarge one of the best in each complete spool

FREE. FREE.

C. LUCAS

35, Manchester St., Liverpool

Hobbies Famous Depôt.

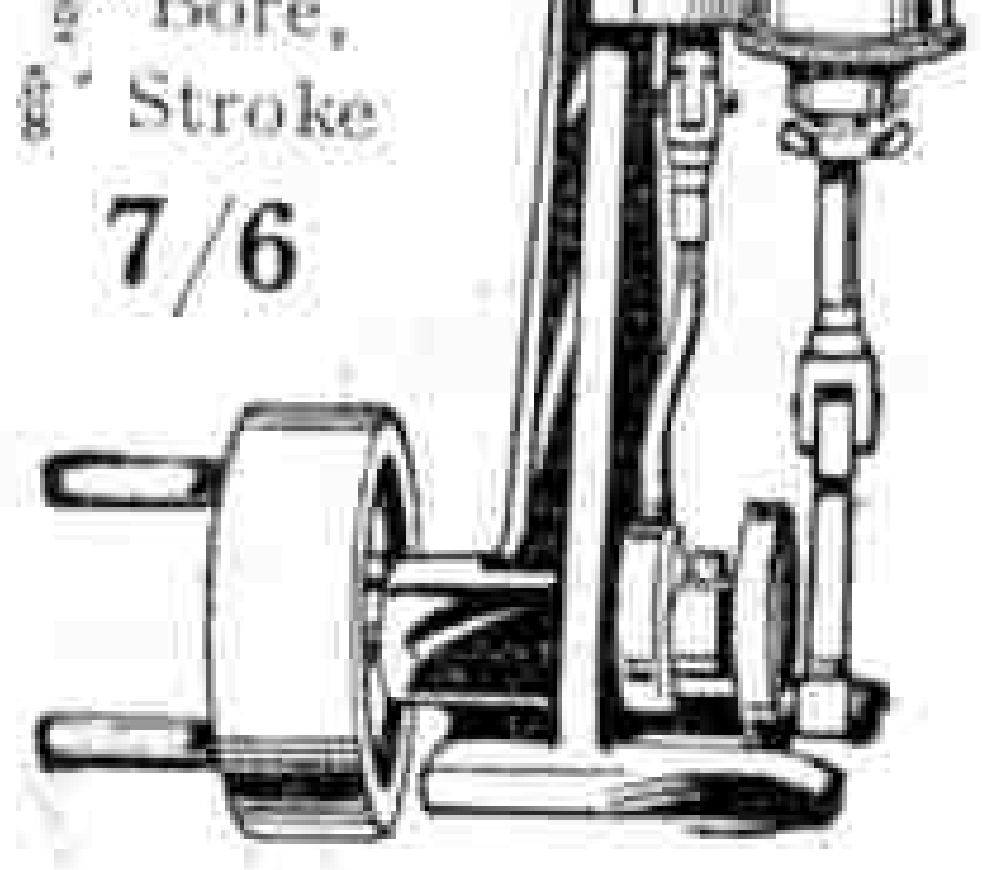
Agent for Messrs. Meccano Ltd., Messrs. Bassett-Lowke Ltd.

This Space is set to ½ inch s.c. and costs 5/- per month. The sum is the 64th of £16, the price of a whole page advertisement. Over 70,000 copies of the December number were distributed all over the world. You therefore reach this exclusive public for less than one penny a thousand.

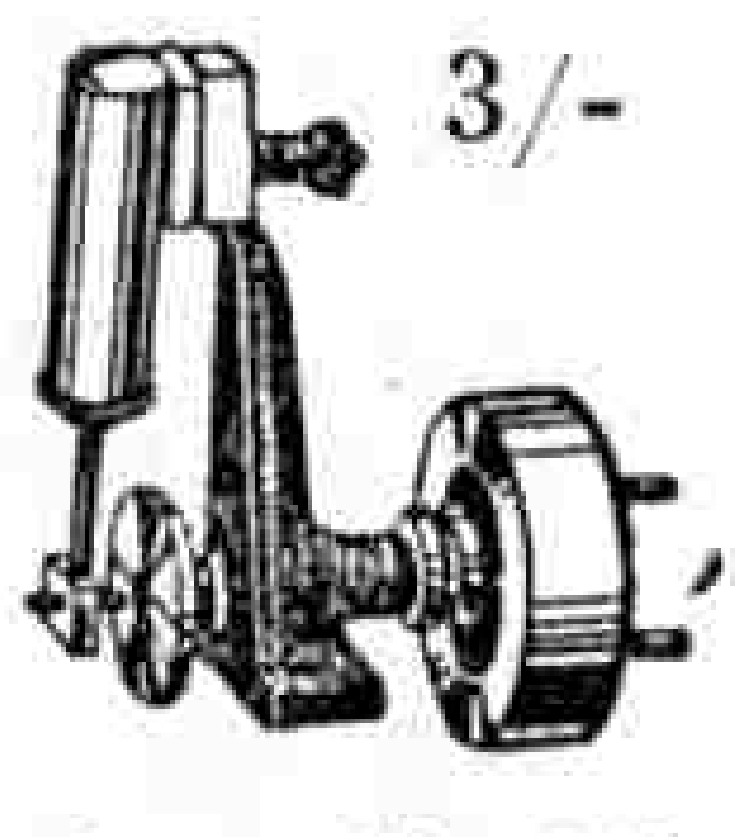
Steam Engines and Fittings

High class British made

PISTON VALVE
Double Acting
½" Bore,
⅝" Stroke
7/6



OSCILLATING MARINE ENGINE
⅜" Bore ⅝" Stroke



3/-

Larger Size **4/6**

Propellers 1¼", 3 Blade, **8d.** 2" **9d.**

Shafts complete with stern tube and stuffing box, 7" rigid **11d.** 9¾" flex **1/-**

Steam Taps, Unions, Water Gauges, Pressure Gauges. Copper Steam Pipe, ⅛", **3d.** ft.

Electric Motors E/1, very powerful ... **6/11**

British made.

Dynamos Accumulators

Railway Agents for Leeds Model Co.

Catalogue 2d.

F. YATES & SON LTD.

144, Church Street, Kensington, W.8.

HARBUTT'S

PLASTICINE

is the most useful accessory for all kinds of model building. It can be an actual part of the model, or used in a similar way to mortar, or even glue, to hold other parts together, or keep them in place. It is made in 10 colours, is clean, and ever plastic. May we send you full particulars and samples —or better still send for a

Rainbow Box

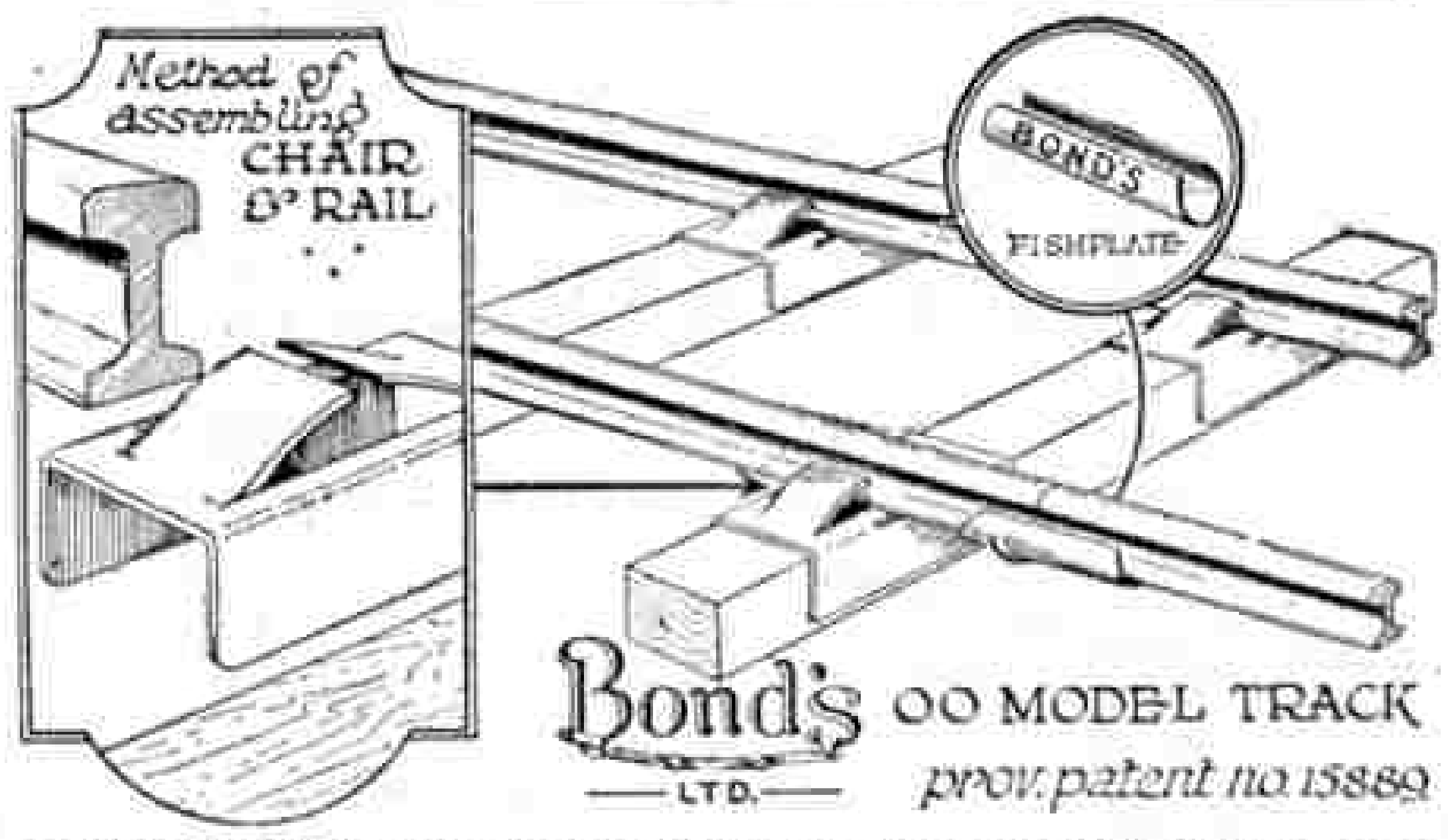
with 6 colours and full particulars.

9d. or Post Free **1/-**

HARBUTT'S PLASTICINE LTD.

99, Bathampton

BATH



BOND'S REAL TRACK FOR GAUGE 'OO' RAILWAY

RAIL IS SCALE CORRECT Bull Head, 2d. each.
CHAIRS are Spring Steel, prov. patent 1/4100.
FISHPLATES are Spring Steel, 6d. doz.
SLEEPERS are Hard Wood, 1/4100.
Send for **TRIAL BOX,** building 3 ft. complete Track.
2/9 **Post 3d.**
BOND'S LTD., 254, Euston Road, LONDON, N.W.

STAMP PERFORATION GAUGE

Stamp collectors will find this card extremely useful in enabling them instantly to find the size of perforation of any stamp. Price 1d. (post free) from the Editor, "*M.M.*"

Result of the "Utility" Competition—

(*Continued from page* 633).

H. C. Thompson's model consists of a "Picture-frame Cramp" and should prove to be of great practical use to every boy who desires to make a picture or photograph frame. It is composed of two pair of Strips, each pair being bolted to a Coupling mounted upon a short Threaded Rod. The Strips radiate from the Rod towards each corner of the frame and carry at any specified point in their length a small bracket built up from an Architrave and two 2" Angle Girders. Each bracket is designed to fit over a corner of the frame while it is under construction. The Threaded Rod passes through the centre transverse smooth bore in one of the Couplings, where it is held against lateral movement by collars and set-screws, and through the centre transverse threaded bore of the other. It may be turned by a Pulley Wheel secured to its centre, and its rotation causes the Couplings carrying the inner ends of the Strips to be drawn gradually together, so imparting considerable pressure upon the corners of the picture-frame, and locking the sides rigidly and squarely in position.

The Third Prize-winning model sent in by Douglas Coxhead takes the form of a "Revolving Blotter." The drum round which the blotting paper is secured is carried from a neat framework built up from Couplings and Axle Rods, whilst another Rod secured in a further Coupling forms a handle.

AQUARIUM FISH

And Plants in great variety, Interesting Pond Creatures, Fish Foods, etc.

The Stocking of **ORNAMENTAL POOLS** a Speciality.

New Catalogue and Guide 3d. post free.

L. HAIG,
Fish Farm, Beam Brook, Newdigate, Surrey.

BOYS MAKE YOUR OWN LEAD SOLDIERS

Cowboys, Indians, Animals, Zulus, Model Station Staff, Rodeo, etc. Our CASTING MOULDS make thousands from any scrap lead WITHOUT PREVIOUS EXPERIENCE. Send stamp to-day for illustrated catalogue.

Complete mould ready for work **2/6**
RODWAYS, 102, Long St., Birmingham
Mention "Meccano"

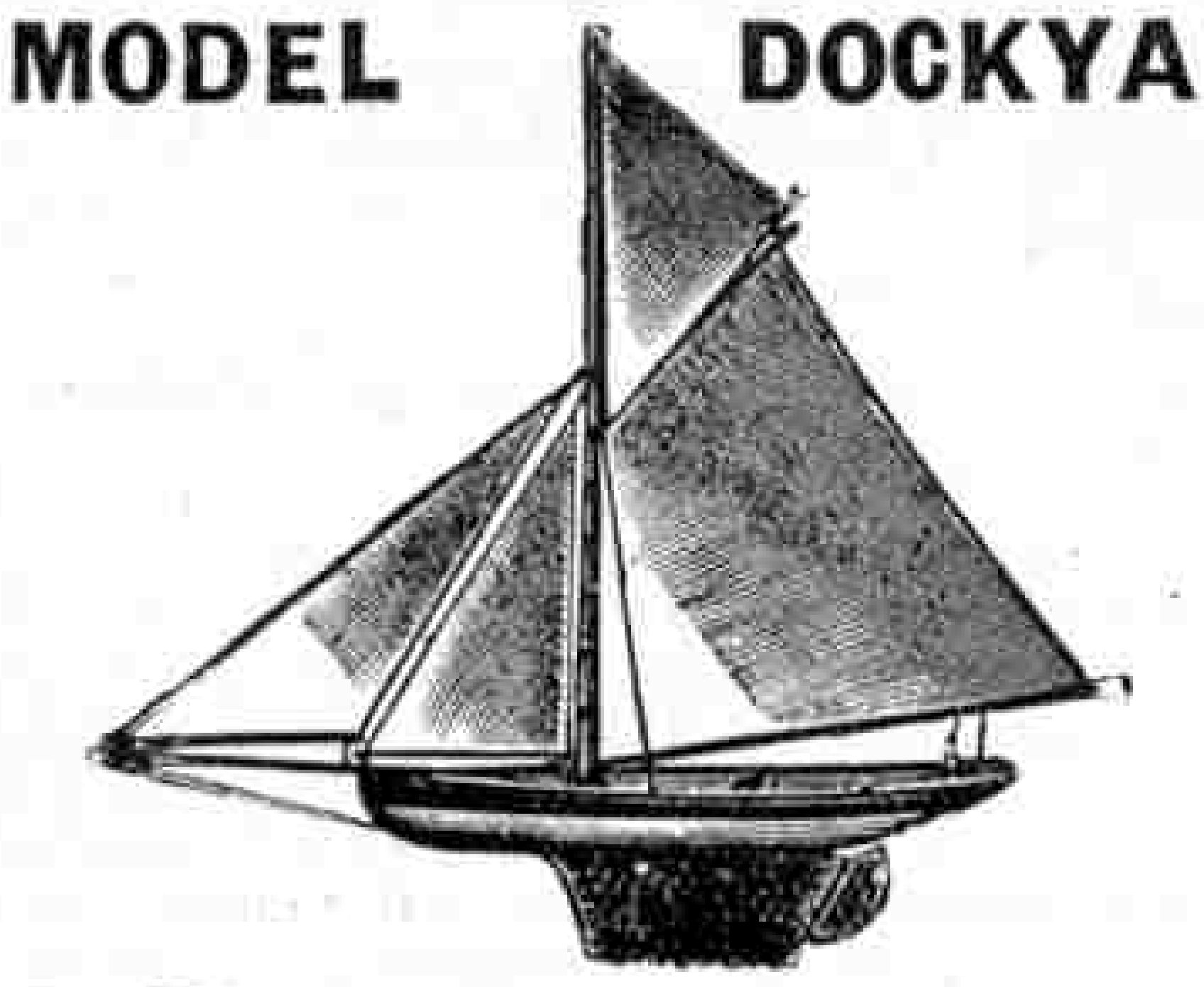
Bind your "*M.Ms.*"

In the advertisement columns of the "*M.M.*" a reader recently offered 2/6 per copy for certain early numbers of the "*M.M.*" in order to complete his file. This offer indicates the value placed upon the "*M.M.*" by some readers, and we suggest that you should see that your file of copies is complete. Keep the Magazines in one of the special spring-back binders we supply. They have strong stiff backs, covered in black imitation leather, tastefully tooled and are lettered gold. The large binder holds 12 Magazines—price 3/6 post free. The small binder holds 6 or 8 Magazines—price 3/- post free.

MECCANO LTD.
BINNS ROAD - LIVERPOOL

KENSINGTON

MODEL DOCKYARD



Sailing Yachts & Fittings

HOBBIES STEAM LAUNCHES

MOTOR BOATS

HORNBY TRAINS

MECCANO OUTFITS AND PARTS

WORMAR STEAM ENGINES

Requisites for
FOOTBALL, HOCKEY,
FISHING, PHOTOGRAPHY

AIR GUNS AEROPLANES
Electric Motors & Accumulators

Send 1½d. Stamp for List "M."

C. H. LORBERG

185, Kensington High St., London, W.8.

Learn to shoot with

"HARMLESS"

Rifles and Pistols.

The "HARMLESS" Rifle shoots with accuracy india-rubber tipped arrows which adhere to the target by suction.

Can be obtained at all stores, toy and sports shops, but insist on seeing the word "**HARMLESS**" on the target.

Rifle sets at
3/–, 4/6, 6/–, 7/6 & 9/6

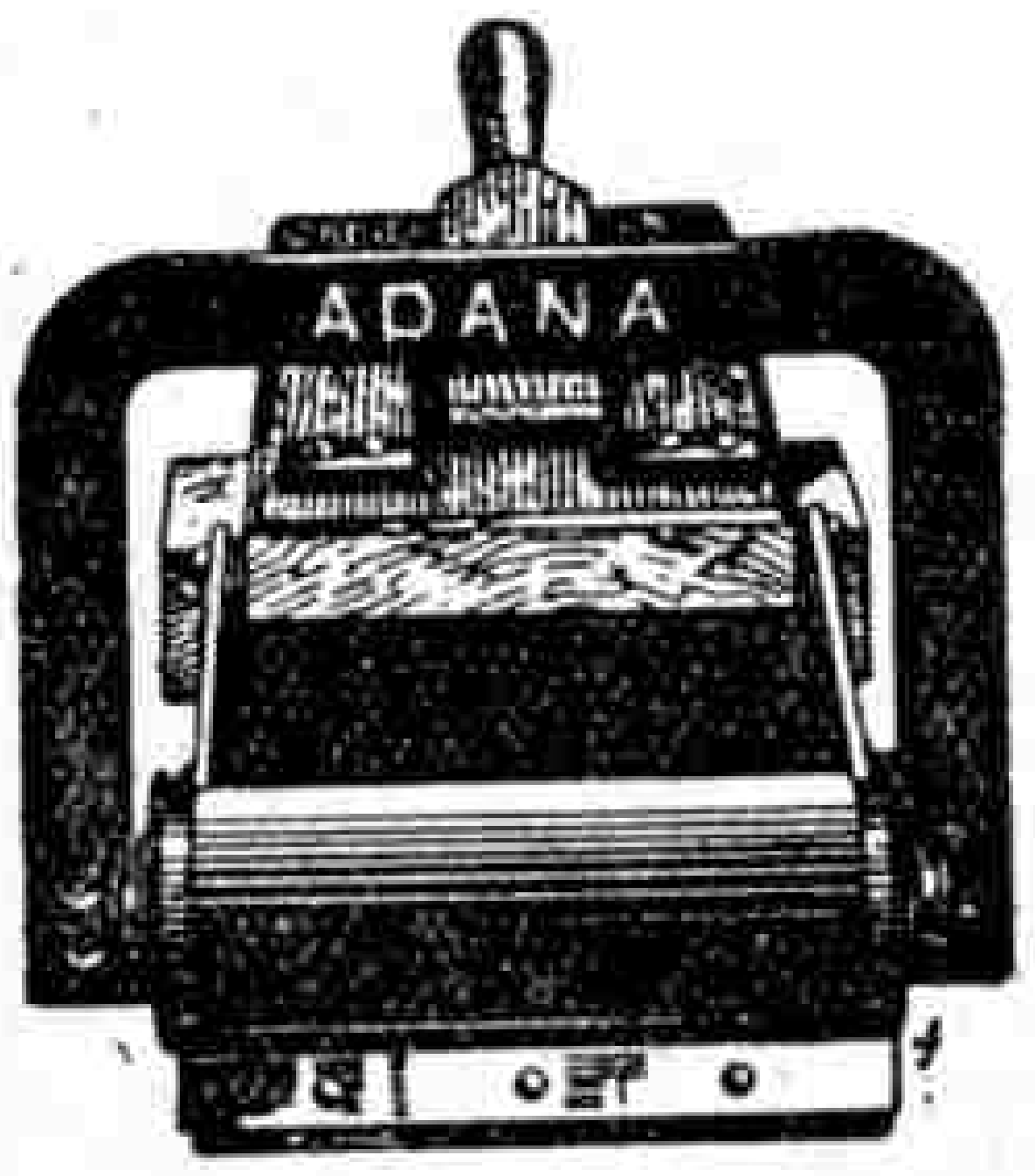
Pistol sets at
2/6, 3/6 & 5/6

As illustration **6/6** post free from manufacturers—

LEWIS WILD LTD.
22, Ropemaker Street,
London, E.C. 2.

ADANA AUTOMATIC SELF-INKING

PRINTING MACHINE



45/-

COMPLETE PLANT

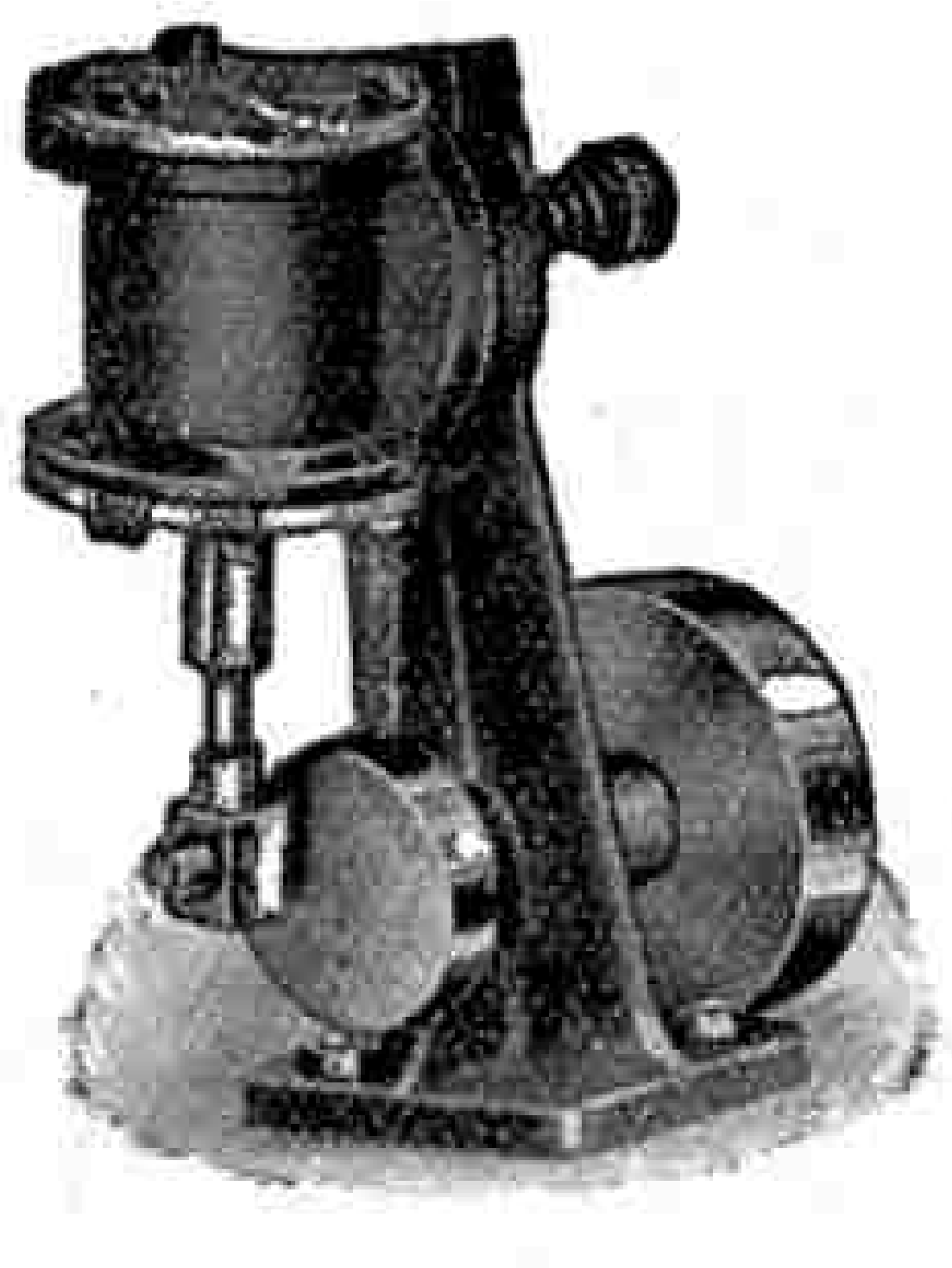
This massively constructed Printing Machine is the most wonderful of its kind. There are now over 10,000 users of these plants, many saving enormously in their own work, others making an excellent living. Will print any class of matter

FROM A CHEMIST'S LABEL TO AN ILLUSTRATED MAGAZINE

including Perforating, Creasing and Box-making. The finest malleable iron and mild steel used in construction. Simplicity to the extreme. No special skill required. Large numbers of boys are producing their School and Scout Magazines. Printers' metal type, case, complete accessories, and excellently illustrated instructional book included. Illus. particulars in two colours, and samples of work, sent on receipt of stamped addressed envelope. Also sold by small weekly instalments. Ask for Terms.

THE "ADANA" AGENCY (Dept. M.M. 7),
34, King Street, Twickenham, Middlesex.

Printers should write for particulars of new system of supplying First-Class Founders' Type.



An Owner writes : *June*, 1926.

"*To give you an idea of what an excellent little engine the S.T. is, I may say I have put her on a Meccano frame on wheels, an elastic band driving a pulley geared to the back wheels. She will pull a trailer with 2½ lbs. in it at a good speed. By itself it simply races.*"

This engine can be built with a screwdriver and we give full instructions. We *guarantee* the engine to work well.

S.T. Engine Parts . . 5/- } *Post*
Finished Boiler 8/- } *Free*

Send stamp for List 12M or 6d. for complete "Engine" catalogue (80 pages). All kinds of engines and boats.

Stuart Turner Ltd.

HENLEY-ON-THAMES

Boys!—

build a working model railway, realistic in appearance and efficient in operation, by using

HORNBY TRAINS

AND ACCESSORIES

Model Railway enthusiasts will find their every want satisfied at the

Arundel Cycle & Sports Stores

"The Hornby Train Shop"

52, Church Road, Upper Norwood, S.E.19

"WIRELESS MADE EASY"

THE BLACKADDA SYSTEM

OF RADIO CONSTRUCTION

Builds Just Like Meccano

Write for Book which describes the system and also contains much useful radio information with over **50 English** and **American** circuit diagrams.

Price 1/- post free

The Blackadda Radio Co. Ltd.

SADLER GATE, DERBY

Telegrams :
"Blackadda," Derby.

Telephone :
Derby, 1820

JENNERS
PRINCES STREET EDINBURGH
LIMITED

EDINBURGH
AGENTS
for **MECCANO** and
Hornby Trains

A complete stock of all Hornby Train Accessories and Meccano parts.

JENNERS PAY CARRIAGE

1/6 THE BULLY BOY 1/6

The Pea Pistol you have been looking for! 20-Shot Repeater. Perfect action; fires a pea 25 feet; bright nickel finish; each in box with Ammunition. A better Shooter than you have ever had before. Send **1/6** and don't miss our latest and best pistol. **Send postcard for 1926 Catalogue.** Foreign and Colonial Postage 9d. extra.

J. Bishop & Co., 41, Finsbury Square, London, E.C.

ROLLER SKATES

Like **Meccano** and **Hornby Trains** they are still as **popular** as ever with all **healthy boys and girls.**

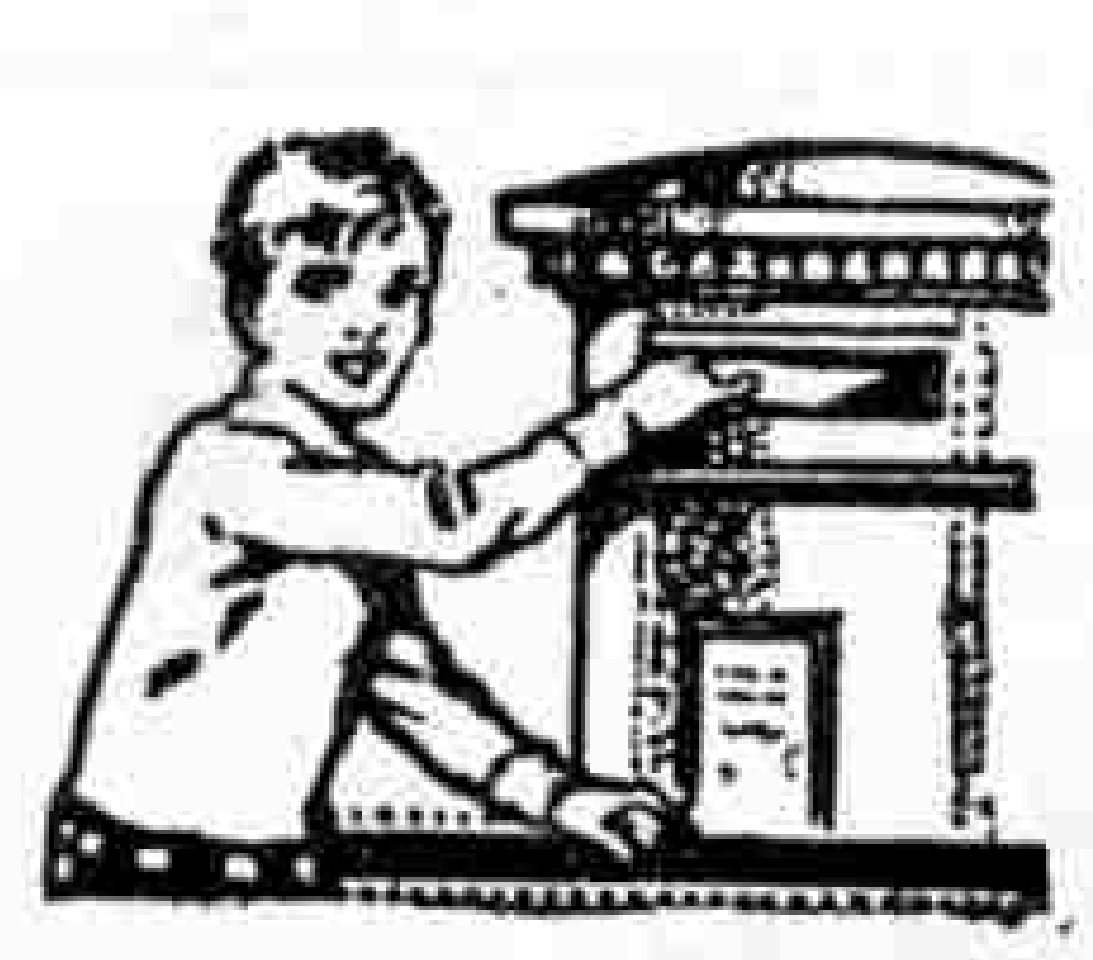
Many years of wear can be got out of them as they are **adjustable** to any size.

We sell the **best make** only, yet our **Prices** are the **lowest** in the trade.

No. 3 with Threaded Clamps and Case-hardened Steel Wheels ...	**5**/– pair
No. 5 with Best Ball-Bearing Wheels, as illustrated	**10**/– ,,
No. 6 with Best Ball-Bearing Wheels and Block Heels	**11**/– ,,

Postage and Packing 1/–. Colonies and Abroad 5/–

Bateson's Sports Depôt, Blackpool



Readers' Sales and Wants

If you have anything to sell or wish to buy anything take advantage of the service offered by a small advertisement in these columns.

The "*M.M.*" is read by approximately 100,000 people every month. It circulates in every country where the English language is spoken. If you wish to sell your duplicate stamps, your rabbits, or your tools, or to purchase a loud speaker, a steam engine, a model yacht, or a hundred-and-one other things, you will be able to do so through the columns of the "*M.M.*"

The rates are one penny per word, with a minimum of 1/- (cash with order).

Your advertisement must be received before the 10th of the month for insertion in the following month's issue.

If a Box Number is used, 4d. should be added to cover the cost of postage of the letters to the advertiser from this office. The letters will be posted one week after the advertisement appears, and a second batch a month after the advertisement appears. They will be sent more frequently if additional postage is included with the advertisement.

IMPORTANT.—Advertisements dealing with any article in the Meccano catalogue cannot be accepted.

READERS' SALES

(*Rate: 1d. per word, min. 1/-*).

Stamps. Wanted to exchange stamps of South Africa with readers in any British Possession.—F. Hawke, Barclay's Bank, Witbank, Transvaal.

Stamp Album Maps, Catalogue cost 12/-. 24 latest Meccano Magazines.—Perry, Benwick Rectory, March, Cambs.

Collection comprising 2,000 stamps, all countries, with album, all my stamps guaranteed clean, unmutilated specimens, without duplicates. £5. Honestly worth double. Particulars—Box 1001.

Vertical Brass Steam Engine, almost new, powerful, and in excellent working order. Cost 30/-. Sell 15/-.—Box 1002.

For Sale. Babcock Boiler, No. 501, been used once. Cost £2. Price 35/-, or offers.—42, High Street, Herne Bay, Kent.

Books: For Sale or Exchange. List Free. Set of Boxing Gloves, slight defect, 6/6.—Dunleavy, 122, Crosslet Road, Dumbarton.

Webley Air Pistol, safety catch, unused spare barrel, Cost 40/-, accept half.—J. W. Dickinson, 3, Ormskirk Road, Aintree.

For Sale. Folding ¼ Plate Camera with Developing and Printing Outfit, Carrying Case, etc., 30/-; also 2¼B Box Ensign F8 with Daylight Developing and Printing Outfit, 20/-; Magic Lantern with Slides, 5/-.—E. Clegg, 21, Duke Street, Burnley, Lancashire.

Sale. "M.M.'s" Sept. 1922–Sept. 1926. Good as new.—E. Clay, Parkwood, Bradley, Huddersfield.

Sale. Motor Boat, Clockwork, Bassett-Lowke Model. Almost new, 16/-.—Jerram, 63, Boundary Road, E.13.

Meccano Magazines, Dec. 1922 onwards, 6/-; Scouts 1925, 5/-.—Godwin, Southborough, Kent.

Sale. Vertical Steam Engine, good condition. Cost 20/-. Take 12/6.—Lovegrove, 105, Colville Road, Acton.

800 Cigarette Cards for Sale. 100% perfectly clean. 8d. per 100.—Box No. 1003.

Fishing Rod, Tackle, 10/-; Cigarette Cards, 10d.; Stamps, 3d. 100. Lists—K. Chapman, "Brooklyn," Dale Road, Matlock, Derbyshire.

Ukelele for sale. Bargain. £1. Good condition.—Preston, 63, Victoria Road, Pendleton, Manchester.

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EDITORIAL AND ADVERTISING OFFICES:—
BINNS ROAD, LIVERPOOL.
Telegrams: "Meccano, Liverpool."

Publication Date. The "*M.M.*" is published on the 1st of each month and may be ordered from any Meccano dealer, or from any bookstall or newsagent, price 3d. per copy. It will be mailed direct from this office, 2/- for six issues and 4/- for twelve issues.

To Contributors. The Editor will consider articles and photographs of general interest; payment will be made for those published. Whilst every care will be taken of those submitted, the Editor does not accept responsibility for any loss or damage. A stamped addressed envelope should be sent where the contribution is to be returned if unacceptable.

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Readers Overseas and in foreign countries may order the *Meccano Magazine* from regular Meccano dealers, or direct from this office. The "*M.M.*" is sold Overseas at 6d. per copy, or mailed (post free) direct from Liverpool, 4/- for six issues, or 8/- for twelve issues.

IMPORTANT.

Overseas readers are reminded that the prices shown throughout the "*M.M.*" are those relating to the home market. Current Overseas Price Lists of Meccano Products will be mailed free on request to any of the undermentioned agencies. Prices of other goods advertised may be obtained direct from the firms.

CANADA:	Meccano Ltd., 45, Colborne Street, Toronto.
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NEW ZEALAND:	Messrs. Browning, Ifwersen Ltd., P.O. Box 129, Auckland.
SOUTH AFRICA:	Mr. A. E. Harris (P.O. Box 1199), Textile House, Von Brandis St., Johannesburg.

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Balloon tyres—
Detachable wheels—
On these toy motors!

THAT'S the sort of car *you* should have for Christmas; a really up to date Lines Bros. British made pedal motor that will stand any amount of knocking about!

Simply by undoing three nuts you can take the disc wheels off, and, if you wish, you can put things in the trunk. The radiator on the L.B. Motor is just like a real one and it's made of polished aluminium. Rather a jolly little 'bus' too; and if you get it with oversize balloon tyres—well, it looks absolutely ripping!

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We've an awfully nice coloured folder showing these and other models. Send for it to-day, it's FREE!

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9, Fore St., London, E.C.2
Works:—
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ENGLAND
Regd. Trade Mark.

See them on Stand 49 at the Motor Cycle Show, Olympia, October 4th to 9th.

Lizzie Motor

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The latest model. Has realistic polished aluminium radiator, disc wheels, bulb horn, trunk, 5 lamps, mirror, etc., length luggage grid folded, 49". Finished azure blue, dark blue, carmine, etc. No. 9, with 1¼" super balloon tyres £6 0 0. No. 7 as illustrated

£5 - 5 - 0

Morris No. 7

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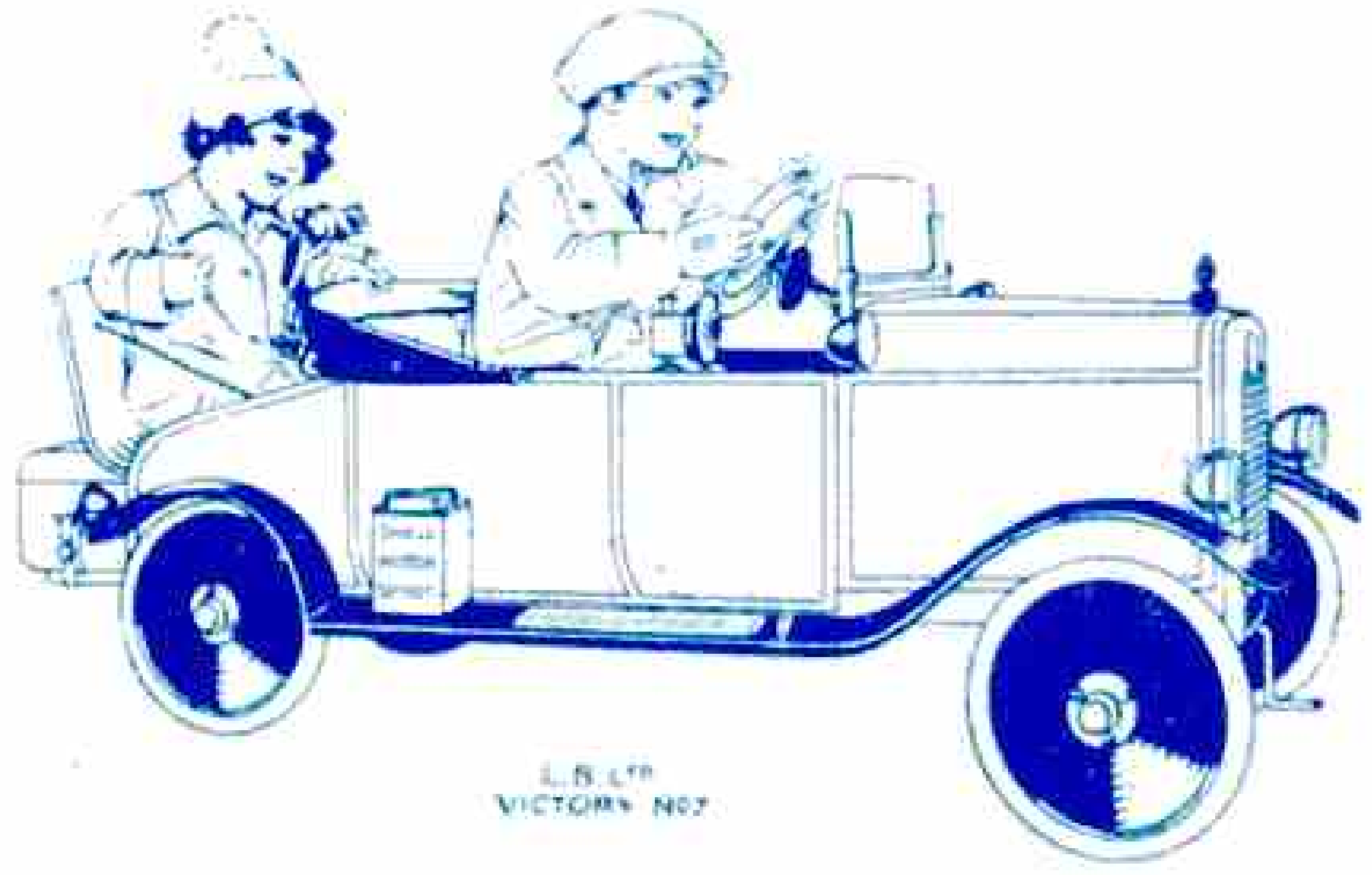
£4 - 6 - 3



Victory No. 7

This is a big model with a newly designed dickey seat. Every accessory is fitted including mechanical horn. Can be obtained in dark blue, dark green, brown, azure, suede, etc. No. 9, with 1¼" super balloon tyres £8 5 0. No. 7 as illustrated

£7 - 10 - 0

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SPORTS AND GAMES WIRELESS NEEDS INDOOR GAMES

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PUBLISHED BY MECCANO LTD., BINNS ROAD, LIVERPOOL
Printed by Stembridge & Co. Ltd., Albion Street, Leeds